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Modern Steam Generating Units for the Smaller Paper Mill Plant

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In the modernization program of the smaller paper mill the problem of suitable boiler equipment invariably requires major considerations. Whether steam is produced for power and process or for process only, the cost of steam in any paper manufacturing plant so influences the cost of the finished product that an error in the selection of suitable steam generating equipment may mean the difference between loss and profit in operation of the plant.

The larger paper mills requiring steam at the rate of one hundred thousand pounds per hour and more have many well proven designs of high capacity and efficient steam generating units to choose from. For the small plant, however, where steam consumption may be only 10,000 lbs. or 20,000 lbs. per hour the field of modern steam generating equipment is quite limited. Often old HRT boilers must be replaced. The space occupied by the old boilers is the only available room for the new units, yet it is necessary to double the steam output because of increased production and power generation, while prior to modernization the electric current was purchased.

The fuel market has become such that the new steam generating units should not be so limited in design as to force the use of only one kind or one type of fuel.

Requirements Summarized

The requirements to be fulfilled by a boiler unit for the smaller paper mill can be summarized as follows:

1. The unit must be reliable to prevent forced interruption in steam supply. Usually only one modern unit is installed and the entire paper mill depends on the reliability of this single boiler.
2. The boiler must be able to handle the large steam load swings encountered in paper mills.
3. Its efficiency must be high because fuel costs are usually higher for the small plant than in plants where large fuel contracts can be placed.
4. It must be compact and must have high steam output capacity per unit of space occupied because a new boiler often is to occupy the space formerly used by an old low capacity boiler.
5. It must produce clean steam when feed water conditions are not ideal. In paper mills the make-up water for boiler feed is usually quite high.
6. It must be so constructed that maintenance expense for boiler, furnace and fuel burning equipment is kept low.
7. Its first cost and the cost of installation, such as foundations, breeching, piping, etc., must be reasonable to insure amortization out of fuel savings within a reasonably short time.

These points were considered in the selection of the new boilers installed during the past year in such plants as the Ohio Wax Paper Company, Columbus, Ohio, Smith Paper Inc., Lee, Massachusetts, Castanea Paper Company, Johnsonburg, Pennsylvania, Newton Paper Company, Holyoke, Massachusetts, and others.

The capacities of these small modern steam generating units are 10,000 lbs. per hour up to 30,000 lbs. per hour. Some are stoker fired, others are burning oil, pulverized coal and natural gas either singly or in combination.

Figure 1 shows a typical stoker-fired unit. The furnace is placed ahead of the boiler instead of under it. Thus, these boilers require little head room. Furnace side walls are water cooled by 3¼ inches diameter tubes on 6⅝ inches centers. The water cooling tubes cross at the top and form a completely

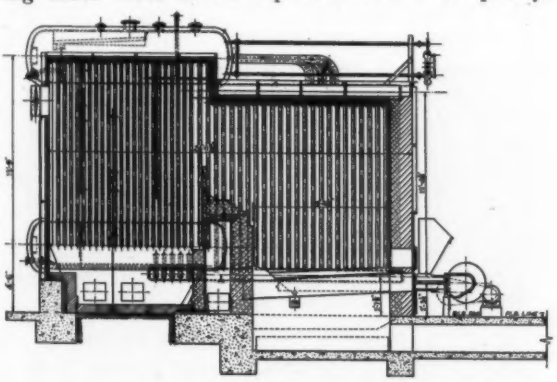


FIG. 1
Stoker Fired Steam Generating Unit

water cooled furnace roof (Fig. 2). Only the front wall is bare brick work. None of the drums is exposed to high temperatures. The effective cooling of the furnace practically eliminates furnace maintenance. The stoker is exposed to lower furnace temperatures, therefore stoker maintenance is naturally much less than if the stoker were placed into a brick set furnace. Coals of low ash softening temperature can be burned without slagging because the mean furnace temperatures are kept well below the fusion temperature of the ash.

With Fig. 3 a pulverized coal and natural gas fired boiler is shown. A tube screen connecting a lower header with the upper drum separates the furnace from the boiler. A vertical tile baffle held between the lower part of the screen tubes forms a bridge wall. Combustion gases make four passes vertically over the boiler tubes.

The high efficiencies obtained with these units are due to a large extent to the integral economizer. (Fig. 4). Feed water enters through the rear end of the

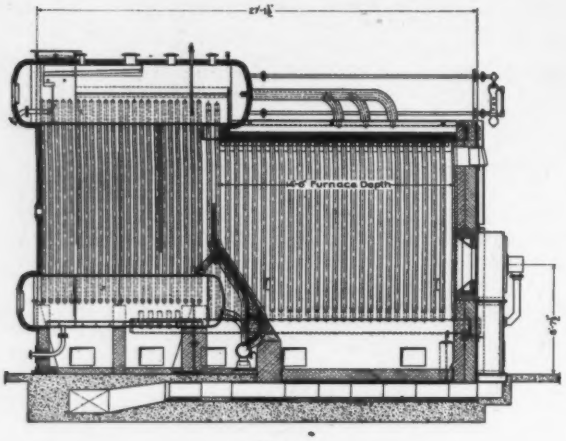


FIG. 3
Boiler with Furnace Designed for Pulverized Coal, Oil and Natural Gas

upper drum and flows vertically down through two rows of tubes into a separate compartment in the lower drum, then vertically up through three tube rows into the upper drum where it enters the natural circulation of the boiler. The partly spent flue gases must pass over the tubes in which the feed water is gradually heated. A large part of the solids entering with the feed water precipitates in the economizer tubes and collects in the sludge compartment of the

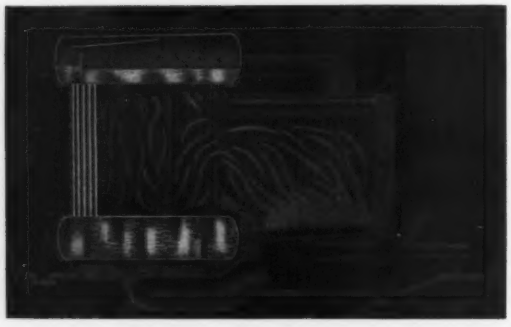


FIG. 4
Unit Is Equipped with Integral Economizer for High Efficiencies

FIG. 2
The Furnace Cooling Tubes Cross on Top and Form Water Cooled Furnace Roof

lower drum, from where the sludge is removed by the blowdown.

Most of the steam generated is, of course, formed in the water wall tubes and in the first few sections of the boiler tubes. This steam enters the upper drum well above the water level. The steam does not have to find its way through a solid body of water, but can freely liberate in an open drum space, thus no turbulence is created in the upper drum and the principal source of water carryover and dirty steam is therefore eliminated. The steam passes lengthwise through the entire length of the drum and is taken off from the rear end of the upper drum through a separator.

Tests conducted for the determination of steam dryness and steam purity as delivered by these units show surprisingly high steam quality, even when the boiler water concentration is unusually high and while the steam load is fluctuating over wide swings.

In the design of these boiler units the ideas common in large power plant boilers have been carried

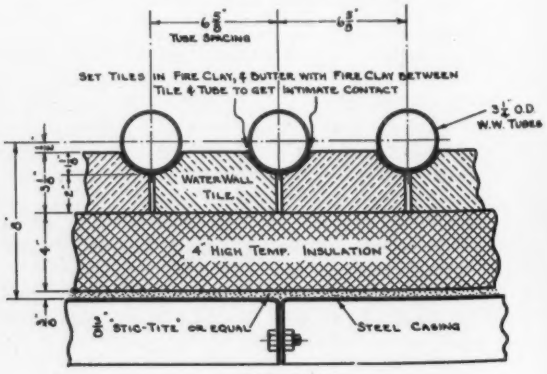

TUBE SPACING
SET TILES IN FIRE CLAY, & BUTTER WITH FIRE CLAY BETWEEN TILE & TUBE TO GET INTIMATE CONTACT
3½" O.D W.W. TUBES
WATER WALL TILE
4" HIGH TEMP. INSULATION
STIC-TITE OR EQUAL
STEEL CASING

FIG. 5
Cross Section through Furnace Wall Structure

out on a small scale. Heavy brick walls are almost entirely eliminated. The side walls of furnace and boiler consist of water cooling tubes covered by shiplap tile and insulation (Fig. 5). The entire unit is completely steel-encased.

Appearance and Utility

The purpose of the steel casing is not appearance alone, although the completed boiler unit presents an attractive picture, as Fig. 6 shows. The steel casing maintains a permanently air-tight setting, keeps the gases in the setting, and prevents the leakage of outside air into the gas passes. The maintenance of high efficiency and the entire absence of brick work repair expenses make the cost of the air-tight steel encased setting a worth-while investment.

High Efficiency

The development of this modern steam generating unit of moderate size makes it possible for the small paper manufacturing concern to obtain all the advantages of a modern steam plant that the large manufacturers enjoyed in recent years. Economical steam production as a result of high efficiency, reliability and substantial absence of maintenance expense almost immediately showed results in reduced costs of the finished product in a number of the paper mills which installed these units.

The Factor of Cost

Engineers and owners of some of the smaller paper mills reported that the cost of the completed installation was no higher, and in some cases actually lower, than the installation costs estimated for boilers of the old "conventional" type. This is understandable if it is considered that foundation work is so much simpler and that expensive boiler setting walls are almost entirely eliminated.

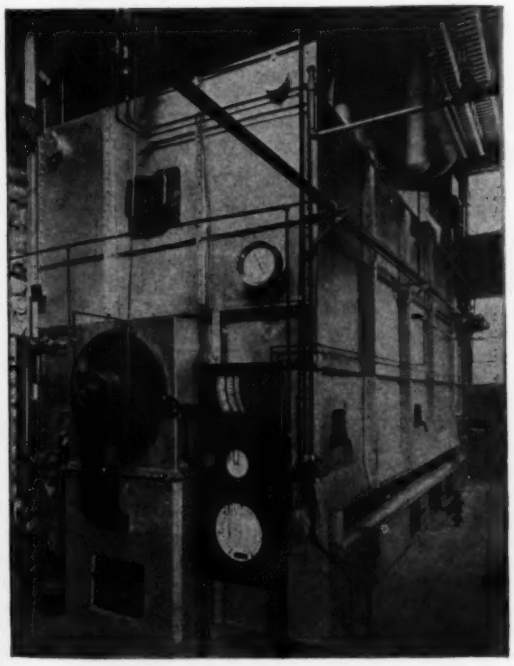


Fig. 6
Photograph of Setting Showing Air Tight Steel Casing

Sterling Shoe Fibre Co. Expands

At the height of the depression early in 1933, the Sterling Shoe Fibre Company, which had been running a small one-machine wet mill in Coventry, Conn., on a special grade of counter board with exceptionally fine results, decided it was time to expand. This was a bold adventure under the existing conditions. After considerable investigation and consultation with builders of machines, John Allen, president, decided on machines built by the Smith & Winchester Manufacturing Company at South Windham, Conn.

Smith & Winchester Equipment Installed

An order was placed with Smith & Winchester for two wet machines, Jordans, pumps and other equipment to be installed in a new mill located at Eagleville, Conn. The sound judgment and hard work of Mr, Allen and his associates was soon evidenced by the increased business and new products developed.

Penacook Fibre Co. Formed

Business improved and in January, 1940, increased capacity was necessary so an expansion was decided on, the outcome of which was the forming of a new company, known as the Penacook Fibre Company, at Penacook, N. H. Here an old stone textile mill building was available which could be revamped to advantage for the use as a paper mill. Machinery in the mill was laid out with the idea of continuous flow as much as possible, eliminating most of the rehandling of products.

Waste paper is loaded onto the second floor where it is fed into the hopper of a Jones pulper located on the first floor in an elevated position so stock is easily charged into the Beater.

Specially Designed Beater

A beater, especially designed by the purchaser, beats and mixes the stock and color, the stock being dumped into horizontal chests in the basement. From the chests the stock passes, by means of Smith & Winchester stuff pumps and Jordans to the mixing box and onto the two 65-inch wide special Smith & Winchester wet machines where sheets 65 inches long and longer are possible.

The sheets are loaded on platforms and taken to the hydraulic press, then by elevator to the third floor of the building where three large steam drying rooms remove the remaining water from the sheets as they pass through the counter current flow of hot air.

Farrel Board Calenders

The board is then lowered to the second floor where it is passed through one of the latest type of Farrel board calenders, on which is attached a Smith & Winchester Feeder, and is bundled for shipment.

The Smith & Winchester Manufacturing Company has worked very closely with the two companies in working out their machinery which is running at high speed on a fine product.

Penacook Running on Special Board

The Penacook Mill was designed principally with the view of making a board which has been imported and is running at the present time on this special board.

Howard Paper Co. Adds to Plant Facilities and Improves Its Mill Equipment

All of the three mills in the organization of the Howard Paper Company, of Urbana, Ohio, have benefited this year by an expansion and improvement program in which $325,000 has been expended for additional facilities to meet the increasing demand for the fine papers manufactured by the Howard, Maxwell and Aetna mills.

Additions and Equipment at Howard Mill

Improvements at the Howard Paper Mills at Urbana, Ohio, include a two-story addition which increased the floor space by 20,000 square feet. The greater part of this new space will be utilized by the finished department and about doubles the area formerly devoted to finishing operations.

This recently complete addition is modern throughout and is equipped with the latest fluorescent lighting and unit heating equipment. An enlarged sample room will be located in this section. New equipment includes mechanical ream-sealing machinery for sealing small sizes as the packages leave the automatic spacer, precision cutter.

During the year, a new 1500 H.P. Westinghouse turbine and condenser, and a new generator for the electric power used in the mill, has also been installed.

At the Maxwell Paper Company mill, Franklin, Ohio, where Maxwell Bond and Maxwell Offset papers are produced, substantial improvements have been completed in 1940.

An addition recently finished at the plant will be used for the laboratory and research departments. Great emphasis has been placed by the Maxwell Paper Company on the importance of paper development and the enlarged facilities provided for this work are expected to give further impetus to this important phase of the company's activities.

Improvements in the moisture control equipment has been made to increase the accuracy of control in pre-conditioning paper.

The work of replacing all dryers with the most modern type of drying equipment, has been completed. To facilitate the handling of raw material and shipments, a new concrete loading dock and runways have been completed. With the announcement of these many improvements comes word of additions of six new colors to the Maxwell Offset paper line.

New Air-Dryer Installed at Aetna Mill

Expansion of the facilities at the mills of the Aetna Paper Company, Dayton, Ohio, where rag content bond and ledger papers are manufactured, includes a large addition to the plant, providing 14,000 extra square feet of floor space. A new Air-Drier machine, embodying the "last word" in this type of equipment, has been installed on the ground floor. Moisture, drying and finish are scientifically determined by automatic electric controls, producing a quality, whether cockle or flat, of exceptional uniformity.

Space on the second floor of this addition is used as an extension of the finishing department, and new equipment has been installed to increase both the facilities and capacity of finishing operations.

Additional storage room for stock items has also been provided on this floor, and laboratory facilities have also been considerably extended.

A new water softening plant for the treatment of boiler feed water has also been placed in service during this year.

Swedish Trade Barter Inc. Formed

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., November 27, 1940—A new corporation has been registered under the name of Swedish Foreign Trade Barter Inc., according to a report from the office of the American Commercial Attache, Stockholm. The company has been formed at the initiative of some of the largest industrial enterprises, in close collaboration with the General Export Association and firms interested in foreign trade. The company actually represents a logical extension of the work of the group formed in 1939 to promote barter trade with Spain. The founders of the company include directors of the Swedish General Export Association, the Wood Export Association, the Paper Mills and the Wood Pulp Associations, the Iron Masters Association, and the Mechanical Industries Association.

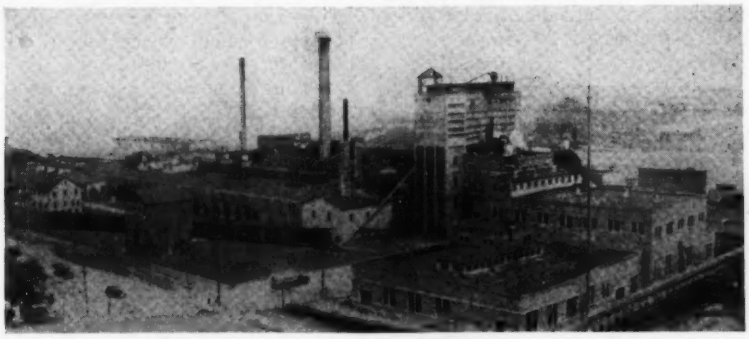
Existing conditions make it imperative for Sweden to find new outlets for its exports, which have suffered severely from the blockade. The new company thus will function as an instrument through which exports and imports will be stimulated and provide a medium whereby Swedish exporters will receive compensation in markets where financial conditions make it necessary to do business on a barter basis. The company will thus not operate in countries with which Sweden has clearing agreements.

According to the articles of incorporation a committee shall be appointed for each country with which the company will do business to consist of officials of the companies interested in such trade, the managing director of the Barter Company and a representative of the General Export Association of Sweden.

Foremanship Training Class Opens

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., November 25, 1940—Forty-three employees of the Menasha Products division of the Marathon Paper Mills Company, Menasha, Wis., are enrolled in a foremanship training school conducted through cooperation of the Menasha Vocational School. Meetings are held every other Wednesday, with enrollment limited to foremen, technical men, and engineering design and construction, maintenance and supervision employees. The course started as a series of conferences but in the last year has developed into one of the most advanced courses of specialized training in the state.



Bathurst Power and Paper Co. Makes Many Important Improvements

Continuing a program of step-by-step modernization, the Bathurst Power and Paper Company, Limited, has again made many important improvements to its mills at Bathurst, N. B. The modernization program was started some years ago with increased capacity, improved quality and reduced manufacturing costs as an objective. Of the many improvements made during the current year, perhaps the major ones are a black liquor recovery plant, four new kraft digesters, a continuous kraft pulp washing system, increased drying capacity on the kraft machine, a new ventilating system and hood as well as screenings preparation system for the cylinder board machine, stores and maintenance building, extension to shops and locker rooms throughout the plant.

New Recovery Plant

The new black liquor recovery plant is an interesting development in recovery plant modernization. Careful design, use of existing buildings and installation of the latest black liquor recovery equipment, resulted in low first cost and a compact layout which is convenient to operate and up-to-date in every detail.

Prior to the installation of the new unit, the recovery equipment consisted of three conventional units each of which comprised a disc evaporator, rotary incinerator and water-cooled smelter. Black liquor for these units was concentrated in a vertical tube, quadruple effect evaporator.

The low pressure boiler house was selected for the new recovery plant because of its well balanced relation between the steam plant and kraft mill. Ample space for the Tomlinson recovery unit and Swenson quintuple effect evaporator was made available by removing one of the Wickes boilers, coal, refuse and ash bins and building an extension 40 x 46 feet. Changes were made to the coal and refuse handling facilities, in addition to the installation of an Allen-Sherman Hoff hydraulic ash sluice to handle the ashes from the remaining boilers.

Part of the old recovery building has been converted into a storage bin of 4000 tons capacity by removing two of the units and constructing a partition wall to separate the one existing unit. Salt cake is fed into the hopper of a 24 x 18 inch swing hammer pulverizer located below the floor level. The pulverizer discharges on a belt conveyor running through a former pipe tunnel to the new recovery building where it in turn discharges into the boot of a 5 x 8 inch bucket elevator. From there the salt cake is carried to an overhead steel storage bin of 30 tons capacity. A gravity discharge chute delivers salt cake to a waytrol which feeds continuously weighed quantities into the mixing tank.

The Babcock-Wilcox and Goldie-McCulloch Tomlinson recovery unit is of the latest integral boiler and furnace design, consisting essentially of a type H Sterling special boiler, water cooled furnace, air heater, forced and induced draft fans and spray tower. The unit has a capacity equivalent to 145 tons of pulp production per 24 hours and is built for a working pressure of 250 lbs. per sq. in., producing 40,000 lbs. steam per hour, dry and saturated, at a pressure of 190 lbs. per sq. in. Absence of a superheater in the path of gases heavily laden with chemical dust minimizes the cleaning usually required. Diamond automatic valve-in-head soot blowers, five on the boiler and two on the air heater, have been installed to keep the hand lancing at a minimum.

Prior to its admission to the recovery furnace, the black liquor is concentrated to approximately 55 per cent totals solids at a temperature of 220 deg. F. in a Whiting Corporation of Canada Swenson quintuple effect evaporator. The evaporator is designed to concentrate the black liquor from 145 tons of pulp per 24 hours. One forced circulation type body is used as the first effect and four long tube vertical bodies for the second, third, fourth and fifth effects. All vapor heads and heating element shells are of ½ inch welded steel plate construction. That portion of the first effect shell extending into the vapor head is armoured with 12 gauge stainless steel. The heating surface of the first effect consists of 315⅞ inches, 16 gauge, 18-8 stainless steel tubes 15 feet long. Each of the four long tube vertical units have 320 2 inch O.D. 10 gauge steel tubes 20 feet long forming 2900 square feet of inside heating surface.

The heavy black liquor is stored in a rivetted steel tank of 4000 cu. ft. capacity equipped with an agitator and lined with 2½ inch brick laid with 2 inch

Portland cement backing and chemically treated joints. All of the twelve pumps of this installation have stainless steel impellers and Ni-Resist casings.

New Kraft Digesters Installed

Probably the most difficult installation of the year was the replacing of four obsolete brick lined kraft digesters of 1885 cubic feet capacity with four all welded steel digesters of 3100 cubic feet capacity. The old digesters were grouped in two rows in the end of the digester building where the chip elevators were located. There was just sufficient room between the elevators and the adjoining building to move the digesters in a vertical position. The old digesters were first jacked up for placement on a special carriage and then rolled outside the building where a 75 ton guy derrick lowered them to a horizontal position to be cut up and taken away. The new digesters were installed in just the reverse procedure. By careful planning of details and close collaboration between the mill staff and the erection department of the Dominion Bridge Company, Limited, who were contractors for part of the work, the digesters were installed in nine days without seriously hampering the production of the kraft machine.

Kraft Machine Drying Capacity Increased

The drying capacity of the kraft machine has been increased by the installation of six 5'-0" diam. x 160" dryers and an exhaust fan in addition to changing several of the felt dryers to paper dryers. The roof of the hood has been insulated and a sliding asbestos board panelled curtain added to the front side.

Continuous Pulp Washing System

A continuous pulp washing system, the third step in the expansion and modernization of the kraft pulp mill, is now under construction. The present washing equipment consisting of a battery of eight diffusers will be replaced by a 9 feet by 12 feet Swenson-Nyman multi stage washer and blow tank. The washer is of all welded steel construction with stainless steel deck and wire cloth and Ni-Resist valve. The blow tank is 24 feet diam. by 60 feet 1¾ inches overall height with a 12 feet diam. cyclone on top and a conical bottom equipped with an agitator. This equipment will be installed in a 40 feet by 48 feet brick and steel extension to the diffuser building. Provisions have been made for the installation of a digester blowdown condensing system at some future date.

Improvements to Cylinder Board Machine

The ventilating system on the cylinder board machine has been completely revamped with the installation of a Ross-Briner economizer, vapor absorption system and new hood. Vapor from the dry end of the hood is exhausted through a conventional Ross-Briner economizer fabricated in fourteen standard vertical sections of cold rolled electrolytic copper by a Silentvane non-overloading type fan having a capacity of 50,000 c.f.m. against 1½ inches S.P. Fresh air for the vapor absorption system is drawn through the economizer and extended surface type radiator heater which raises the temperature to approximately 200 deg. F. by a Silentvane non-overloading type fan having a capacity of 43,800 c.f.m. against 4 inch static pressure. The distribution header supplying the nozzle pipes in the various pockets formed by the sheet of board passing over the dryers, is located at the back side of the machine. Each nozzle pipe has two rows of depressed type nozzles extending across the entire machine width. The hood is built in panels of ¼ inches asbestos board with curtains on both sides and 2½ inches gypsum insulation on the roof. Along the entire front side of the hood are sliding panelled curtains to permit access to any particular dryer when it is necessary to spear off the sheet of board.

A system has been developed to handle kraft, sulphite and groundwood screenings. The rejects from both the kraft and sulphite knotters are refined in a Williams shredder which discharges directly into a storage chest. Rejects from the sulphite and groundwood fine screens are dehydrated on a decker discharging into the same chest as the shredder. The mixture of screenings is further refined in a Shartle Miami jordan before being lapped on two 86 inches Waterous wet machines. As required in the manufacture of cylinder boards, the laps are repulped by a Carthage pulp shredder.

Stores and Maintenance Building

The stores department has been reorganized and moved to new quarters in a three storey, brick and steel building adjoining the shops. In addition to complete mill stores, the building houses the electrical, planning and engineering departments offices, storage rooms and a large locker room for the maintenance staff. Bins and racks for the 7000 items carried in stock are arranged for heavy stores on the ground floor and small stores on the second and third floors. An elevator provides means of transportation between the floors. In conjunction with the stores and maintenance building an extension was built to the shops to bring together all of the maintenance crews. The new extension is 50 feet wide by 75 feet long and is of brick and steel construction.

New Locker Rooms

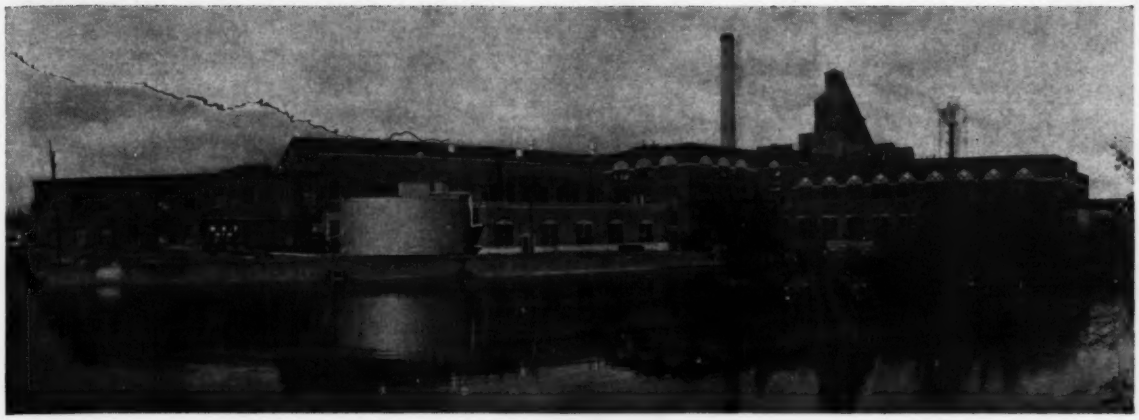
New locker rooms have been built in practically every department. Each is equipped with a steel locker for every man, tile shower compartments, lavatories, Bradley wash basins and an air conditioning system. The walls are of white tile and the floors of colored concrete.

Considerable attention has been given to the aesthetic appearance of the plant. Lawns have been laid out and vines planted around the buildings. The new concrete pavement in front of the mill and the lawns keep down the dust and thereby help the manufacture of clean products. The mill fencing has been completed with the erection of 4000 feet of all steel fence around the wood yard, wood mill and groundwood mill.

Masonite's Canadian Plant at Capacity

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., November 25, 1940—In connection with the news given out in New York to the effect that production of the Masonite Corporation for the 12 months to August 31 had been the largest on record, it is stated here that Masonite's new Canadian plant has been operating at capacity. This plant is jointly owned with the Canadian International Paper Company Limited.



Flambeau Paper Co., Plant at Park Falls, Wis., Is Modernized and Expanded

Ascertaining from a recent comprehensive survey that the raw material sources within its immediate mill area are adequate to its needs for many years to come, the Flambeau Paper Company, Park Falls, Wis., has continued its policy of plant modernization and expansion throughout the current year. Additional improvements are also planned for installation in the year 1941.

Production efficiency, quality and output have thus been increased, and almost every department can now be said to be modernized to avail the mill of the latest in equipment. A summary of the 1940 improvements includes the following:

In the finishing room there have been installed a new high speed cutter with overlapping delivery, static neutralizer, dust eliminator, and counter, all supplied by the Maxson Automatic Machinery Company. There has also been added a large Seybold cutter and other converting equipment. Humidifying equipment also was installed in this department to reduce static during the dry winter months.

Improvements on Paper Machine

Improvements on the paper machines consisted mainly of the installation of Stonite and granite rolls and rubber-covered suction rolls on some of the presses to improve the finish; a new Nash vacuum pump to increase the vacuum and reduce the moisture content of the sheet on the No. 1 machine, and additional fan equipment to improve working conditions.

Additional eccentrically operated flat screens were installed in the screen room to permit double screening of the sulphite stock. In the bleach plant, a new vertical low density, high capacity bleacher has been added. The major equipment was supplied by the Nekoosa Foundry and Machine Works of Nekoosa, Wis.

Extensive Changes in Boiler Room

Extensive changes also were made in the boiler room, where three of the old R. T. boilers were removed and replaced by a new three-drum Type H Babcock and Wilcox boiler of 40,000 pounds capacity. This boiler is equipped with a furnace designed to burn either hog fuel or coal, separately or mixed. Detroit spreader type stokers are being used for coal and the hog fuel is fed by chutes onto flat grates. The mill is located in an extensive lumbering area where hogged fuel is supplied in large quantities. The refractory material, for the greater part, was supplied by the H. Detrick Company and the A. P. Green Fire Brick Company. Installation was made by Michael Liptak for the Babcock and Wilcox Company. In addition, a new Permutit de-aerating feedwater heater and a Madden continuous blow-down system were installed. Republic feedwater, flow and stack temperature meters were included. Coal will be handled direct from car to stoker hoppers by Robbins Conveying Belt Company conveyors. Engineering was directed by Sargent and Lundy of Chicago. Provision was made so these units can absorb the increased production capacity planned for the immediate future.

Handling of roll stock is greatly facilitated by two additions built to the roll wrapping department. One is for roll room supplies and the other for shipping, so rolls can move from the machines direct to cars without going through the finishing room.

Laboratory Facilities Enlarged

Enlargements also were made in the company's laboratory facilities. An addition of tile construction was built to the laboratory, virtually doubling its size. There has been installed the additional equipment necessary to give the best customer service, and to satisfy the specifications of new grades. This work has just been completed.

One of the yard projects is now under way with the work being done by C. R. Meyer & Sons Company of Oshkosh, Wis. It is the reinforcing of the canal wall leading to the grinder turbines, using interlocking steel piling. The length of the wall is approximately 1,200 feet.

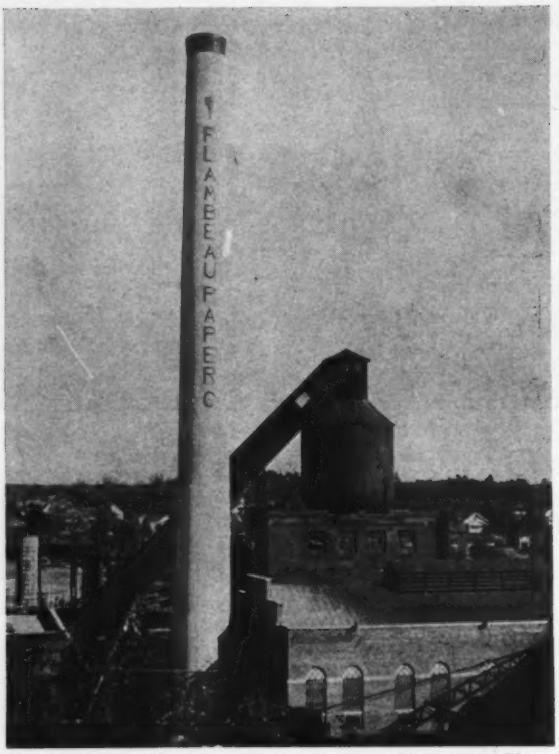
Sulphite Capacity To Be Increased

Set up as the major item for 1941 is the installation

of equipment for increased sulphite capacity. A 15-ton digester has been purchased which not only will increase the sulphite output about forty tons per day, but will permit improved quality due to better cooking conditions. Additional screens also have been purchased, along with other complementary equipment such as tanks, pumps and coolers. The digester building will be enlarged accordingly, and additional bleaching capacity probably will be required.

Expenditures Run Into Large Sums

Improvements and expansion have been going on at the Flambeau Paper Company for the last five years, since a new management took over the mill. The expenditures running into large sums have been based on an aggressive sales policy which has built up a demand for better grades, and also on the company's faith in the future because of its strategic location for pulp wood supply and its conversion on a ton-cost basis comparing favorably with mills either moving to or springing up in areas where there are generous supplies at the door. The Flambeau mill is located in the heart of the northern Wisconsin area established as the Chequamegon National Forest, embracing more than a million acres. Here the government is carrying on some of its most extensive reforestation of the Lake States region, ready to augment the timber now being harvested annually.



THIS 189-FOOT CONCRETE STACK AT THE FLAMBEAU MILL WAS COMPLETED LAST YEAR ALONG WITH THE IMPROVED BOILER HOUSE SHOWN BELOW IT.

Large Wood Supplies Available

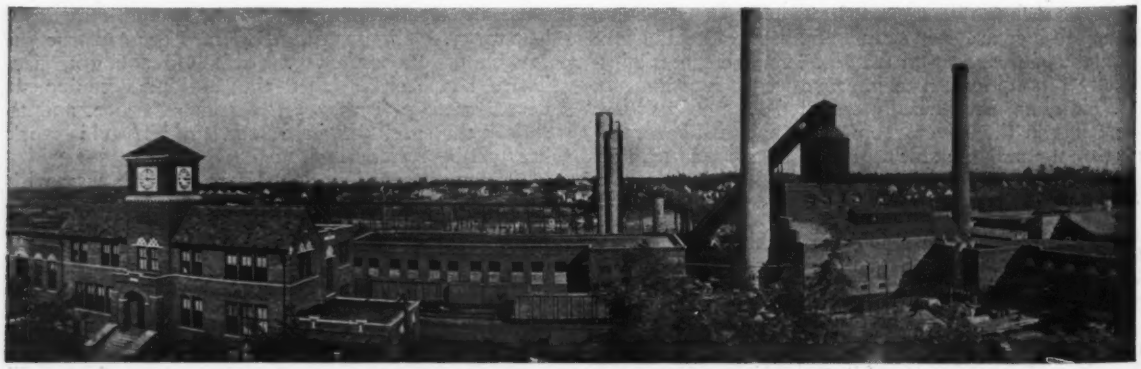
In commenting upon this situation, W. A. Munro, president of the company says: "The great attraction of the West Coast or the South has undoubtedly been the abundance and cheapness of our principal raw material—wood. Is it not possible that some mills have moved before making a thorough study of the standing and reproductive capacity of the timber adjacent to their original sites?

"In our State of Wisconsin, we are familiar with the cutover lands and the temptation to move where wood is cheap and abundant. Yet some mills, including our own, have found through intelligent surveys that reasonably cheap wood is available and that the annual increment in second growth is more than sufficient to meet their needs.

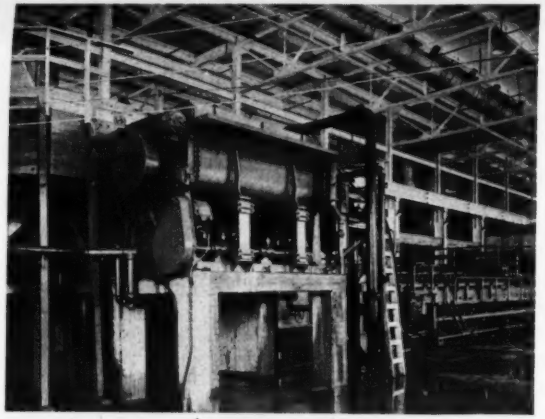
"An intensive survey of lands adjacent to our mill, both company and privately owned, was completed by us recently. It showed that enough wood is available on a sustained yield basis not only to support our present operations but also to justify an increase in pulp-making capacity of at least forty tons per day. The credit for this optimistic picture should be given largely to the United States Forest Service, which is doing a remarkable job in bringing back the forest resources of Wisconsin."

Transition in Grades Made

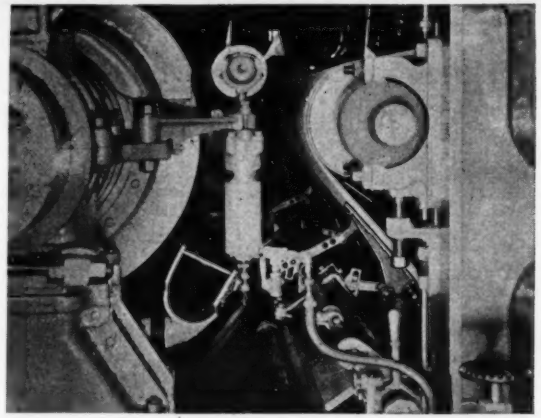
Up to five years ago, the Flambeau mill was producing ground wood grades entirely such as newsprint, poster, halftone and pencil tablet. A transition began, with accompanying mill changes, until sulphite grades are replacing the ground woods to a considerable extent. Newsprint has been dropped entirely. About sixty per cent of the production is now on sulphites such as waxing, manifold, typewriter, high



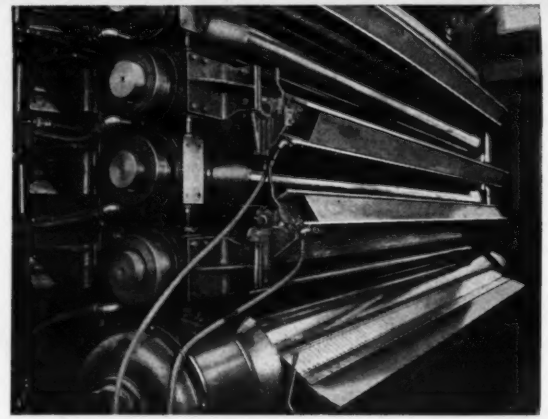
A STREET VIEW, SHOWING AT THE EXTREME RIGHT THE NEW BOILER HOUSE COMPLETED WITH IN THE LAST YEAR.



At HOLLINGSWORTH & WHITNEY'S new Chickasaw Mills here is one of the four big Bird 3A Screens employed on the Fourdrinier machine. Four Bird 1A Screens are used on the cylinder machine.



One of the Vickery Felt Conditioners on the job at the new Hollingsworth & Whitney mill. Vickery Doctors are installed on dryers and calenders.



At CHAMPION PAPER & FIBRE'S new Pasadena mill, in addition to these Vickery Hi-Flex Doctors on every calender roll there are five big Bird Screens and every press felt is equipped with a Vickery Felt Conditioner.

IN THE MILLS YOU READ ABOUT

BIRD Dual Drive SCREENS assure a continuous supply of clean, well combed, uniform stock, free of lumps, strings and slime, providing the capacity to permit fine cut screen plates plus gentle, efficient screening action.

VICKERY FELT CONDITIONERS keep press felts continuously clean and open right through the week, avoiding the production losses and expense of mid-week shutdowns to wash up clogged, dirty felts.

VICKERY DOCTORS, specially designed and engineered for each individual application, keep every roll spotless and shining—always in shape to do its best work.

For full information about any or every item of Bird Machinery and what it can do in your mill, write

BIRD MACHINE COMPANY · South Walpole, Mass.

grade tablet and other 100 per cent sulphite printing papers. The mill consumes its entire pulp output for its own papers.

Permutit Builds Filler Plant

When the company first decided to improve the quality of its product and to make higher grades of paper in the bleached sulphite range, its initial step was a cleaner water supply. A filter plant was built in 1936 by the Permutit Company for automatic chemical treatment of water, and its discharge into a large settling basin. A new water piping system was installed, using streamline copper with sweat fittings for all up to 4-inch, and wood-lined above 4-inch. Since then new piping for fresh water and the old white water and stock pipes have been changed throughout the entire mill to copper, Herculoy bronze or wood lined. Most of the stock tanks have been tile lined and others will be tiled as fast as possible.

Screening System Rearranged

There followed other changes in rapid succession. The entire pulp screening system in the ground wood pulp mill was rearranged, resulting in a decided improvement in the cleanliness of the pulp. Improvements in the sulphite mill included installation of two F.M.P. circulating systems on the digesters. New blow pits were provided, including stainless steel drainer bottoms.

A new low density bleaching unit designed by the Pennsylvania Salt Mfg. Co. was installed to increase the capacity of bleached pulp. Necessity for washers and the expense of lapping was eliminated by adding a new Oliver bleach washer and a slush system, consisting of a large blending tank and a high density Allis-Chalmers pump with patented air escape attachment to convey 6½ per cent A. D. sulphite to the bleachers.

An extensive program of white water utilization was carried out under the guidance of C. M. Baker, C.E., resulting in high efficiency in the way of preventing losses in the mill effluents.

One of the paper machines was equipped with a Beloit dual press, making increased production possible and at the same time gaining other benefits in performance.

Boiler Plant Enlarged

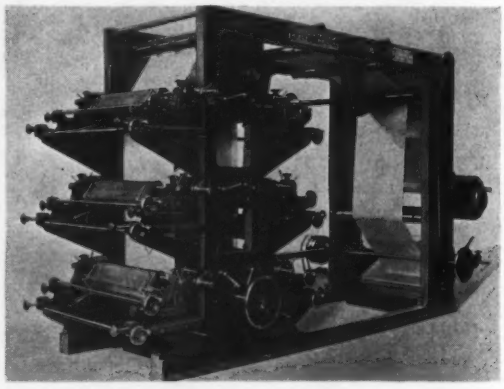
With these alterations came the necessity to enlarge the boiler house and rebuild a part of the old one. Its architecture conformed to other units of the plant, and included glass block windows, with ventilation controlled by adjustable louvres at various elevations. The first new boiler was a 500 hp., B. and W. Three-drum Class H Stirling, capable of developing 1,000 hp. It was fitted with a B. and W. superheater, Diamond soot cleaners and other auxiliaries. A large extension furnace was provided at the front to burn hog feed (sawmill refuse). The oven was built in two sections fitted for either coal or refuse.

Last year the sulphite wood room was rebuilt and provided with modernized equipment. All new steel conveyors were installed, built by C. G. Bretting Manufacturing Company, Ashland, Wis. An American barking drum supplied by Fibre Making Process of Chicago was included and it is 12 feet in diameter by 45 feet in length. Other equipment includes a D. J. Murray pulp wood slasher and a bark press built by Nekoosa Foundry and Machine Company.

With these improvements and a well-established market, the Flambeau Paper Company envisions a greater future and an enlarged business.

New Cottrell Heinrich Press

A new printing press for use with aniline inks, available for printing on one or both sides of a web, in any number of colors up to six, has been developed by C. B. Cottrell & Sons Company, Westerly, R. I., in cooperation with H. H. Heinrich, Inc., New York. Of heavy construction throughout, the new



New Multi-Color Aniline Printing Press

press is built for fast production of first-grade work, with a number of important features designed to insure close register and uniformity of printing. New features are provided for obtaining accurate impression on paper, cloth, cellophane, foil, or cardboard. Register is easily adjustable, both along the web and sidewise, while the press is running. Ample space between the printing units allows time for drying between colors at high speeds, with over ten feet of drying space between the last color impression and the first guide roller touched by the printed web. The press can be equipped either with the conventional two-roller fountain or the new mono-roll system with rubber ductor blade. Plate cylinder sizes range from 7 to 30 inches, and web speeds up to 1000 feet per minute are entirely practical with this new press.

Sparklekote Gummed Paper

Among the new and attractive gummed papers recently brought out by McLaurin-Jones Company is their new Sparklekote gummed paper.

This Sparklekote line can be furnished in thirteen various shades and tints, in addition to white. The range of colors runs from the dark shades of red, green and blue to the very delicate ivory and primrose shades.

The one outstanding feature about this Sparklekote line is its high receptivity to printing, as well as to pen and ink. Sparklekote is the answer to the current demand for glossy printed labels, and is also adaptable for many other types of work where a sparkling, live sheet of gummed paper is required. Sample books covering this line are available, and will be gladly sent upon request.

Chickasaw Mills at Mobile, Are Started By Hollingsworth & Whitney Co.

The following descriptive article together with illustrations was supplied by the Hollingsworth & Whitney Company, Boston, Mass.

The Hollingsworth & Whitney Company of Boston announce the beginning of operations at the Chickasaw Mills which they have built near Mobile, Ala. Situated just north of the city proper the plant is on tide water at the junction of Chickasawbogue and Mobile Rivers. The plant site covers 135 acres which gives ample room for efficient straight line production and expansion.

The mills are a complete unit consisting of pulp mill, pulp drying machine, bleach plant, Fourdrinier machine, and cylinder machine, together with all the auxiliary equipment required to produce high grade pulp and paper made from Southern pine. The plant is designed to produce approximately 200 tons of sulphate pulp, both bleached and unbleached. The paper machine capacity is approximately 160 tons. The balance of the plup will be dried for shipment.

Hardy S. Ferguson & Co. of New York have been the consulting engineers, and Rust Engineering Company of Pittsburgh have been the general contractors. Fay, Spofford & Thorndike of Boston have designed certain of the administration buildings. Grinnell Company, Inc., of Providence has supplied all production and sprinkler piping, as well as the air conditioning installation. The Allegheny Industrial Electrical Company did the electrical work.

Officers and Operating Executives

The officers of Hollingsworth & Whitney Company are M. L. Madden, president, W. B. Merlin, vice president, H. C. Thayer, treasurer, and Robert Nivison, manager of mills.

The operating executives of the Chickasaw Mills at Mobile are D. E. Cousins, mill manager, William Nivison, assistant manager, V. C. Watters, superintendent of paper mill, R. F. Cuyle, superintendent of pulp mill, C. A. Redden, chief engineer, R. F. Erickson, assistant plant engineer, F. B. Smith, power engineer, G. R. Dubus, master mechanic, Lawrence Bushell, chief electrician, E. M. Leavitt, chief chemist, R. F. Weston, chief forester, C. V. Riefenberg, office manager, H. G. Torbert, executive secretary, R. E. DeNeefe, Mobile traffic manager.

The Wood Yard

It is planned to receive wood at the plant by truck, rail and barge. The wood yard is located at the north end of the mill where it may be reached conveniently by switch from the Alabama State Docks Railroad, by truck via a separate road that does not pass through the mill yard, and by barge via the inland waterway system, or via Alabama's fine river system.

Under ordinary conditions logs 5 feet 3 inches in length will be furnished direct to the barking drums over Jeffrey log conveyors. There are two 12 feet by 45 feet D. J. Murray trunnion type barking drums with flat belt drive. After the barking drums the wood passes a log sorting conveyor and platform where unsatisfactory bolts will be re-routed through the barking drum or submitted to special cleaning processes to remove seams and knots. The bolts are chipped in two 88 inch, four knife Carthage chippers which are equipped with card breaker attachment. These are driven by direct connected General Electric Company synchronous motors.

The chips are next passed over two Orville-Simpson Company Rotex chip screens, from which accepted chips are passed to storage. Otherwise, chips are routed through a Waterville Iron Works chip crusher; sawdust and bark are transported via a waste conveyor to the Hofft bark burning furnace.

The Digester Building

Accepted chips, clean and of uniform size, are handled on Jeffrey conveyors from chip crusher to digesters. Chip storage is located at ground level, and the storage bin holds a supply adequate for approximately 16 hours' operation. The chips from this bin pass to the top of the Digester House where they are distributed to the digesters.

The inclined belt conveyor is equipped with an automatic weightometer and rateograph manufactured by Merrick Scale Manufacturing Company. These instruments record the weight of chips charged to each digester, insuring control of quantity and quality from the start of the operation.

There are four Blaw-Knox digesters, 11 feet in diameter by 47 feet overall height. The digesters are equipped with Fibre Making Processes Company indirect liquor heaters, and circulating pumps so connected as to permit either direct or indirect cooking.

The blow valves are 8 inches in diameter, manufactured by Reading, Pratt & Cady.

The blow tank and trap, as well as other steel tanks at the mill, were furnished and erected by the Hammond Iron Works.

The heat value of steam in the blowing process is recovered through a Foster-Wheeler Flash type blow-down condenser, 16 feet 4 inches x 8 feet overall dimensions.

From the blow tank the pulp is washed in a 3-stage counter current vacuum washer system consisting of three 8 feet x 12 feet washers, each having 300 square feet drainage area, furnished by Improved Paper Machinery Corporation. Tanks beneath the washer system provide for the storage of strong, intermediate and weak black liquor and pulp, and there is a dump tank to permit the removal of pulp from any stage in the event of a shut-down.

The Screen Room

The pulp next flows to the Screen Room where a larger screen area than usual has been designed by Impco. to produce pulp of unusual cleanliness. The plup first passes through three knotters of the type first developed at the company's Waterville mill. Then it flows through a large battery of felt-lined rifflers, constructed of cypress, and then through a battery of centrifugal screens. Finally, it passes through a system of diaphragm type flat screens

INSTALLATIONS IN MILL OF HOLLINGSWORTH & WHITNEY CO.

MOBILE, ALA.

1. Finishing Room Looking North, HOWE Scale in Foreground.

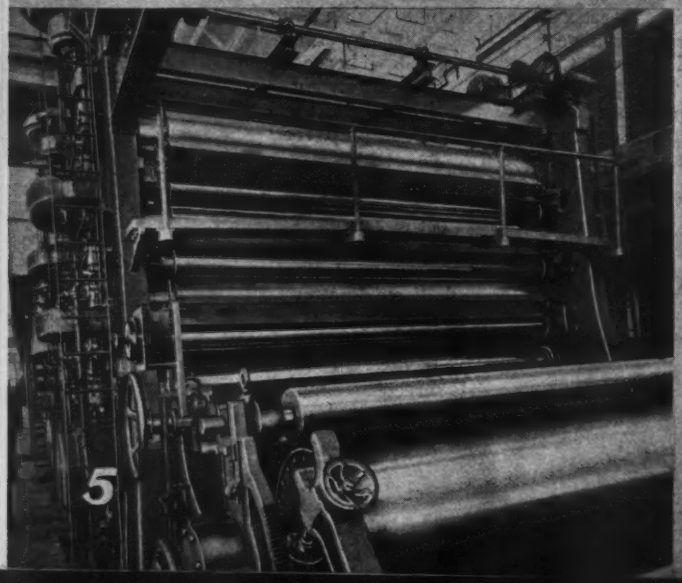
2. Rifflers with Knotters in Background, Looking Northeast.

3. BALDWIN - SOUTHWARK Press, Looking Southwest.

4. Digester Building — FOSTER WHEELER Condensing System, Looking Southeast. Blow Tank and White Liquor Storage in Background.

5. Calender Stack on Fourdrinier Machine Equipped with VICKERY Hi-Flex Doctors.

6. Jordans and Hydrafiners, Looking Southwest.



equipped with Dunbar drive and bronze vats. Union and Fitchburg screen plates have been installed with Witham screen plate fasteners.

The pulp is then thickened on large Impco. vacuum deckers, and thence flows to Stebbins tile-lined storage tanks, where it is thoroughly blended by continuous agitation. The agitator assembly was by the Hill Clutch Machine and Foundry Company.

Provision has been made for production of baled pulp in sheets for which an 80-inch Fourdrinier pulp drying machine, from one of the company's Northern mills, equipped with a Beloit Iron Works suction couch roll, has been installed. The drying machine is equipped with a Hamblet Duplex sheet cutter, a Mathews roller type conveyor, and a Baldwin-Southwark baling press.

Stock from the screen room may be dried or used in process as brown stock or it may be passed through the bleach plant, which may be considered the next step in the process. Improved Paper Machinery Corporation has supplied Thorne bleaching equipment, producing fully-bleached pulp by a continuous process. All chests and towers in this department are constructed of concrete and were tile lined by the Stebbins Engineering and Manufacturing Company.

In order to eliminate contamination, extensive use has been made of rubber-lined and other special piping, and the operating room of the bleach building is lighted by glass brick panels. The building is ventilated by a forced ventilation system.

Density of stock is controlled by Northern Equipment Company Copes Consistency Regulators and Impco. stock meters.

Chemicals for the preparation of bleach liquor are fed to the system by efficient handling methods. The equipment for sulphur dioxide handling has been supplied by the Virginia Smelting Company.

Pulp at high density is stored in four cylindrical concrete tanks, tile lined by the Stebbins Engineering and Manufacturing Company. The pulp is carried to the tanks by conveyors, and is pumped from them to the pulp drying machine or Stock Preparing Department.

The Beater Room

Pulp from the stock storage system is pumped to individual stock thickeners which empty into filling tanks located over each of the seven 2,500 lb. Horne beaters. These beaters, manufactured by J. H. Horne & Sons Company, are of a new design developed in collaboration with Robert Nivison, manager of mills of Hollingsworth & Whitney Company.

The size making system consists of a number of tanks supplied by the Mobile Steel Company, together with equipment designed especially for this installation. Wooden tanks for the storage of alum have been supplied by the Hauser-Stander Company.

Following treatment in the beaters, the stock is pumped through a battery of six Dilts hydrafiners, operating at 1200 r.p.m., capable of passing 700 to 800 gallons per minute of stock at 4½% consistency. Final treatment of the pulp is accomplished by the use of eight Jordans manufactured by the Emerson Manufacturing Company.

All motors for this department are controlled from a special battery of General Electric Company cubicles, situated on an elevated bridge in the central part of the building.

Cylindrical stock tanks in this department, and also for the paper machines were constructed by the Stebbins Engineering and Manufacturing Company. Proper mixing of stock is insured by Noble & Wood propeller type agitators.

The Machine Room

Stock from this department next passes to the paper machines.

Paper machine No. 1 is a Pusey & Jones 184 inch Fourdrinier, with a trim of 164 inches.

This machine is equipped with four Bird screens.

There is an Impco. screen for tailings, and a saveall to handle the white water.

The paper machine is also equipped with: Midwest Fulton drier drainage system, Ross Engineering Company ventilating system and calender blowers, Whiting cranes, General Electric Company sectional motor drive.

Lubricating oil is circulated through a Bowser purifying system.

At the end of the machine, there is a high speed Pusey & Jones slitter and winder for slitting paper into rolls. In the basement are situated a broke beater manufactured by Dilts Machine Works, a Worthington air compressor and Nash vacuum pumps.

Paper machine No. 2 is a cylinder machine with an improved Pusey & Jones 124 inch stream flow wet end. Incorporated in this machine are new Pusey & Jones stream flow vats recently installed for the first time at the company's mill at Waterville, Maine.

This machine is also equipped with Bird screens, Ross ventilating system and other modern auxiliaries.

It is driven from a line shaft by a General Electric single motor drive with small helper motors at the wet end. This machine is followed by a high speed Langston slitter and winder for production of rolls. Four large Bird Dual Drive 3A screens are operating on the large paper machine and four small No. 1A Bird screens are used on the small cylinder machine. The big machine is also equipped with Vickery felt conditioners on the press felts and Vickery doctors on the driers and calender stacks. The small machine also has 14 Vickery Hi-Flex calender doctors on the stack.

The combined capacity of these two machines is approximately 160 tons per day.

The Finishing Department

Paper from these two machines progresses to the final building in the production line, on the second floor of which is situated the finishing department. Finishing equipment includes the latest model Hamblet Simplex and Duplex cutters for the production of sheets, and slitters constructed by the Kidder Press Manufacturing Company to produce finished rolls. For small sized sheets and for trimming, the finishing department is equipped with Seybold precision trimmers.

Howe scales and recording devices are used for the weighing of papers.

Paper is transferred by elevator to the ground floor. Elevators in this building and elsewhere were installed by George T. McLauthlin Company of Boston.

The Shipping Room

The ground floor contains a commodious shipping room. Along the east side of the building extends a

Congratulations to....

HOLLINGSWORTH & WHITNEY COMPANY!

DURING A PERIOD OF MANY YEARS WE HAVE FURNISHED GROUNDWOOD AND SULPHITE PULP MILL EQUIPMENT TO YOUR MAINE MILLS, AND IT GIVES US A GREAT DEAL OF PLEASURE TO HAVE FURNISHED FOR YOUR CHICKASAW SULPHATE MILLS, MOBILE, ALABAMA, THE FOLLOWING:

1 **"IMPCO" 8′ dia. Lime Sludge Filter**

Complete Black Liquor Washing Equipment, including Three (3) "IMPCO" 8′ dia. Vacuum Washers and Repulpers.

2 **"IMPCO" 8′ dia. Double Valve Vacuum Deckers**

3 **"IMPCO" Centrifugal Knotters**

5 **"IMPCO" Centrifugal Screens, Design #4**

16 **"IMPCO" Bronze Vat Flat Screens with Dunbar Drive**

4 **"IMPCO" 42″ x 128″ Open Cylinder Thickeners with integral drives**

THORNE BLEACHING EQUIPMENT

6 **"IMPCO" 8′ dia. Vacuum Bleach Washers**

STOCK METERING EQUIPMENT

1 **"IMPCO" 8′ dia. Vacuum Saveall**

2 **"IMPCO" Bronze Vat Flat Tailing Screens**

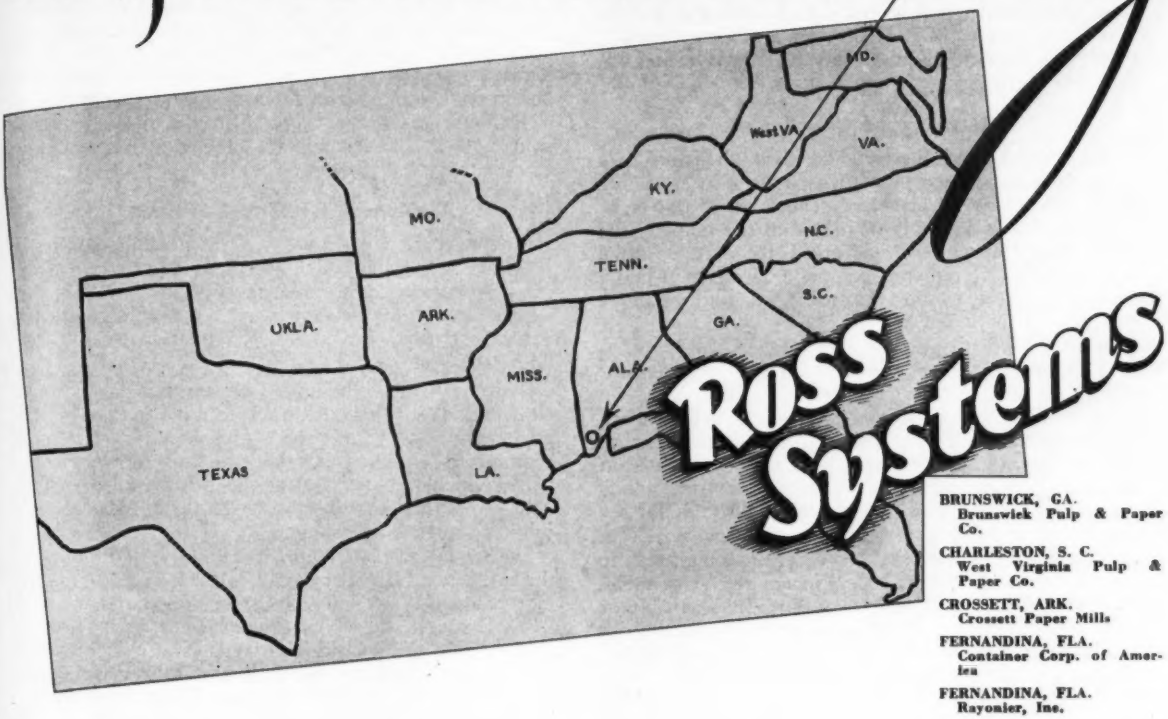
IMPROVED PAPER MACHINERY CORPORATION

NASHUA, NEW HAMPSHIRE

"IMPCO"

Hollingsworth & Whitney....

one of the *17 new* southern mills using



BRUNSWICK, GA.
Brunswick Pulp & Paper Co.

CHARLESTON, S. C.
West Virginia Pulp & Paper Co.

CROSSETT, ARK.
Crossett Paper Mills

FERNANDINA, FLA.
Container Corp. of America

FERNANDINA, FLA.
Rayonier, Inc.

FRANKLIN, VA.
Chesapeake Camp Corp.

GEORGETOWN, S. C.
Southern Kraft Corp.

HOUSTON, TEXAS
Champion Paper & Fibre Co.

JARRETT, VA.
Johns-Manville Corp.

LUFKIN, TEXAS
Southland Paper Mills, Inc.

MERIDIAN, MISS.
Flintkote Co.

MOBILE, ALA.
Hollingsworth & Whitney Co.

PISGAH FOREST, N. C.
Ecusta Paper Corp.

PLYMOUTH, N. C.
North Carolina Pulp Co.

PORT ST. JOE, FLA.
St. Joe Paper Co.

SAVANNAH, GA.
Union Bag & Paper Corp.

SPRINGHILL, LA.
Southern Kraft Corp.

This tabulation refers only to *new* mills recently constructed in the South. A longer list of older mills have long been users of Ross Systems. In fact, the results that have been secured from Ross Systems in the older mills accounts for the almost unanimous selection of the Ross Systems for these new Southern mills. In design and construction features, Ross engineering has kept apace of new developments in the industry. But the reliability of Ross Systems in achieving required results in the various mill departments continues to make them practically standard equipment—today as in the past.

HEATING AND VENTILATING SYSTEMS . . . VAPOR ABSORPTION . . . ROSS-GREWIN SYSTEMS . . . EXHAUST SYSTEMS . . . AIR CONDITIONING . . . MACHINE HOODS . . . CALENDER AND MOTOR COOLING . . . TRIM CONVEYING . . . DUST REMOVAL . . . GRINDER ROOM SYSTEMS.

J. O. Ross Engineering Corporation

Main Office—350 Madison Avenue, New York

201 N. Wells Street, CHICAGO 3503 California Ave., PITTSBURGH, PA. 12953 Greeley Avenue, DETROIT

shipping platform for rail shipments, while the west side of the building has another covered platform from which shipments may be made by truck.

Outgoing rail shipments from the mill will be handled over the tracks of the State Docks Terminal Railway, from which they may be transferred to any of the five railroad systems serving Mobile, or to steamships.

To the west of the paper machine room, and served by a transfer car, is a machine shop and roll grinder room. In addition to a battery of lathes, drills and other metal and wood working tools, there is a Seybold knife grinder, a Lobdell Carwheel Company roll grinder and a Bridgeport Safety Emery Wheel Company knife grinder for chipper knife.

Recovery of Chemicals

Having followed the product through from logs to finished paper, we now turn to the processes for the recovery of chemicals and generation of power.

Strong black liquor removed from the pulp by the first stage washer is transferred to storage tanks from which it is fed to a complete Swenson 6 body, quintuple effect evaporator equipped with Labour pumps.

From there it passes through 2 D. J. Murray Cascade evaporators from which it emerges at a density of 55% solids.

From a storage tank it is pumped to the Babcock & Wilcox mix tank where desired quantities of make-up saltcake are added. Saltcake which is received in cars has been stored in 3 conical bottom steel tanks from which it is fed to the mix tanks through Jeffrey conveyors, crusher and weight control device. From the mix tank it is pumped by Worthington pumps to two Babcock & Wilcox Tomlinson recovery units, each of which is capable of handling the black liquor from the production of 95 tons of pulp per day with ample over capacity. Steam capacity is 33,600 lbs. per hour at 600 lbs. gauge pressure each unit.

The smelt goes to the dissolving tanks from which it emerges as green liquor, through a Worthington pump to the Causticizing system. The Causticizing system is a Dorr Company installation, consisting of one green liquor clarifier, one dregs washer, one white liquor clarifier, one lime mud washer, one improved type turboslaker and three causticizers.

The system is equipped with Dorrco Diaphragm pumps for the lime mud and Worthington and Morris pumps for the liquor.

Lime sludge is pumped to one 8 feet x 4 feet Improved Paper Machinery Corporation sludge filter, from which it flows by gravity to an 8 feet x 160 feet Vulcan Iron Works rotary lime kiln.

The lime kiln is fired with gas fuel through Coppus Dennis fan mix type burners. The temperature in the firing zone is controlled by Leeds & Northrup radiation pyrometers.

Fresh and re-burned lime are fed by Link-Belt and Jeffrey conveyors through screens to steel tanks. Lime from these tanks is controlled by Ross feeders.

Babcock & Wilcox Boilers

Additional process steam is generated in three Babcock & Wilcox fuel fired boilers. One of these boilers is equipped with a Hofft bark burning furnace for the consumption of waste, but may also burn other fuel if required. Boilers are equipped with B. & W. trifuel burners for the consumption of pulverized coal, gas or oil. They have a capacity of 89,000 lbs. of steam per hour at 600 lb. gauge pressure.

Both fuel-fired boilers and recovery boilers are equipped with Sturtevant Forced and Induced draft fans and B. & W. air pre-heaters.

Feed water heaters are manufactured by Worthington, and the boiler feed pumps are manufactured by Ingersoll-Rand.

Recovery units are equipped with Bailey Meter Company meters.

Boilers are equipped with Diamond Power Specialty Company soot blowers and bi-color water gauges and Republic Flow Meters combustion control. Hall Laboratories, Inc., are the company's consultants for boiler feedwater treatment control and service.

Exhaust gases are vented through a single brick smoke stack, 225 feet high, 11 feet 8 inches in diameter at the top.

General Electric Turbine

The steam is piped to a General Electric Company 7500 KVA turbine which bleeds at 130 lbs. pressure for pulp cooking and exhausts at 30 lbs. pressure for drying and other process work. Republic reducing valves are used for pressure reduction to 130 lbs. and 30 lbs. additional steam.

The company obtains a substantial part of its electricity from this turbine, through which all process steam passes, and the supplementary electricity required is supplied by the Alabama Power Company, which has installed at the plant a 22,000/2200 volt—7500 KVA transformer bank sub-station adjoining the turbine room.

Power is generated at 2400 volts. All motors in the mill over 50 HP operate at 2200 volts. Smaller motors operate at 440 volts, receiving current from 2400/480 volt step-down transformer bank located just outside of the turbine room. The company has an arrangement with the Alabama Power Company by which it will supply power to the utilities system in case of public emergency.

The lighting circuit is supplied by individual 440/220/110 volt transformers installed outside of the various buildings. At some distance from the turbine room is a transformer station providing 13,200 volt power to transmission lines serving the deep well pumps.

There are over 500 motors in the mill, ranging in size from ¼ hp. to 1100 hp. Motors were supplied by the General Electric Company.

The mill power is controlled throughout by General Electric cubicle type controls.

The wiring throughout the mill has been installed by the Allegheny Industrial Electrical Company as sub-contractors to the Rust Engineering Company. Extensive use has been made of conduit buried in concrete. Exposed conduit is heavily waterproofed.

The Office Building

At the southeast corner of the mill building fronting on U. S. Highway No. 90 near the entrance to Cochrane Bridge across Mobile Bay, is situated a group of buildings designed by Fay, Spofford & Thorndike of Boston. The office building is insulated and fully air conditioned to provide the optimum working conditions for the staff controlling the company's operations at Mobile. The upper sash of this building is glazed with Coolite heat resisting glass.

In the rear of the office building are situated the time room office and locker building in which company payroll records are centralized, and in which are contained shower baths and individual locker facilities. This building is equipped with an efficient ventilating system.

First Aid Department

The building north of this houses the laboratory and first aid department. Efficient insulation from the outside atmosphere was the prime factor under consideration in the planning of this building which is lined with hollow tile. The building is air conditioned, and complete facilities are provided for physical and chemical analysis. The first aid department is in the north end of the building, consisting of a dispensary, a first aid room, and a hospital room.

High Quality Water Supply

The greatest attention has been paid to the development of an adequate high quality water supply. To this end, the Layne-Central Company was engaged to supply and construct a deep well water system consisting of 25 wells extending several miles northwest of the mill site. These wells are equipped with Layne-Bowler pumps. Water is obtained from two different strata, and each strata has its own chemical characteristics, though both are of high quality. So careful has the company been to preserve exact characteristics of product that a complete duplicate pipe line and reservoir system has been installed throughout the mill to carry to each process the water of the characteristics best adapted for use.

The pipe line from the wells is of Armco Spiral welded steel, bitumastic lined. The lining was applied under the supervision of the Wales Dove Hermiston Company.

The Layne-Central Company erected the pipe line and electric transmission line controlling the General Electric motors driving each well pump.

At the end of the pipe line and adjacent to the plant are two storage basins for transit storage consisting of two concrete reservoirs with concrete dome covers holding 1,250,000 gallons each. The water is aerated in these tanks, which were constructed by the National Gunite Contracting Company by the prestress method.

A pump house containing three pumps insures a full supply of water to the mill. One of these pumps is a spare. In addition there are two fire pumps. All of this equipment was manufactured by Goulds Pumps, Inc.

Valve connections and controls have been installed to meet any emergency condition which may cause a failure in part of the system.

Fire Protection System

A complete fire protection system has been designed with the advice of the Associated Factory Mutual Insurance Companies of Boston, including a 125,000 gallon elevated sprinkler supply tank supplied by the Chicago Bridge & Iron Works, Ludlow hydrants, and Rust hose houses. Sprinklers in all combustible buildings were installed by the Grinnell Company, Inc.

In addition to the piping installed by the Layne-Central Company, two other piping contractors contributed to the job.

All outside water piping was installed by the Pittsburgh Piping & Equipment Company under a subcontract with the Rust Engineering Company.

All inside steam, water and process piping was installed by the Grinnell Company, Inc.

Insulation of steam piping and certain process tanks is glass manufactured by and erected under the direction of engineers of Owens-Corning Fiberglas Corporation of Toledo, Ohio.

Valves Throughout the Mill

Valves throughout the mill were supplied by: Chapman Valve Manufacturing Co., Dezurik Shower Co., Reading, Pratt & Cady, Hills-McCanna, Yarnall Waring Co., Golden Anderson Manufacturing Co., Powell Valve Manufacturing Co.

Effluent from the various mill processes flows through a sewer system which contains a weir in each department. These weirs are equipped with recording instruments to keep a measurement of all wastes voided. The main sewer flows through a large settling basin on company property where objectionable foreign matter is removed before water leaves the mill site.

General Building Construction

General building construction is divided into several types:

In buildings where tight construction is of paramount importance, brick walls have been used.

In other process buildings, transite siding fastened to steel girts replaces the brick.

In locations where maximum ventilation is desired, such as the Boiler Plant, an open louvre transite construction has been used.

Certain processes, such as the barking drum and lime kiln, have not been housed.

All manufacturing buildings are of steel frame construction with reinforced concrete floors. Steel sash has been used throughout except for the glass brick on the operating floor of the Bleach Plant.

In sprinklered buildings, built-up bonded wood roofs have been used.

Elsewhere, roofs are of pre-cast concrete slab.

Instruments and controls throughout the mill were supplied by: Republic Flow Meters Company, Taylor Instrument Company, Bailey Meter Company, Leeds & Northrup, Manning, Maxwell & Moore, Brown Instrument Company, Fischer & Porter Company, Mason-Neilan Regulator Company, Foxboro Company.

Pumps for Various Processes

Pumps for water, white water, and many other process uses were supplied by Goulds Pumps, Inc.

Special stock pumps were supplied by the Bingham Pump Company, Portland, Ore.

Other special pumps were supplied by the Worthington Pump and Machinery Company.

All parts of the mill will be kept in constant communication with the management office by an intraplant telephone system installed by Southern Bell Telephone Company.

A system of synchronized International Business Machines time clocks has been installed in the mills, and other I.B.M. equipment will be used in the office. Office equipment is by Remington Rand, Inc.

Allis-Chalmers texrope drives, Falk couplings and gear reducers have been used extensively in machinery drives.

FROM *Mobile...*

STOWE-WOODWARD SERVES THESE MODERN MILLS

These twenty-two companies are representative of the leading mills which have installed Stonite Rolls or Stowe-Woodward Rubber Covered Rolls as part of their new construction or modernization programs during the past twelve months.

Allied Paper Mills
Berst-Forster-Dixfield Co.
Champion-International Co.
Champion Paper & Fibre Co.
Consolidated Water Power & Paper Co.
Container Corporation of America
Great Northern Paper Co.
Hammermill Paper Co.
Hollingsworth & Whitney Co.
Kalamazoo Paper Company
Longview Fibre Co.
The Mead Corporation
Millers Falls Paper Co.
Papelera Moderna, S.A.
Rhinelander Paper Co.
Riegel Paper Corp.
San-Nap-Pak Manufacturing Co.
Smith Paper, Inc.
Southern Kraft Corp.
Southland Paper Mills
Stevens Paper Mills, Inc.
West Virginia Pulp & Paper Co.

In supplying rolls for these outstanding mills, we have been privileged to co-operate with the following paper machinery builders.

Bagley & Sewall Co.
Beloit Iron Works
Black-Clawson Co.
Downingtown Manufacturing Co.
Pusey & Jones Corp.
Rice, Barton & Fales, Inc.
The Sandy Hill Iron & Brass Works

★ *Makers of* WHITE STAR *Rubber Covered Rolls,* TANNITE *Couch Rolls*

Sub-Contractors and Manufacturers of the Principal Equipment

Achesen Manufacturing Co.	Heaters
Aerofin Corp.	Gas
Air Reduction Sales Corp.	Cinders
Alabama Power Co.	
W. D. Allen Mfg. Co.	Texrope drives
Allis-Chalmers Mfg. Co.	Blowers
American Blower Co.	Pipe and tubing
American Brass Co.	Valves
American Car & Foundry Co.	Cast iron pipe and fittings
American Cast Iron Pipe Co.	Chain and cable
American Chain & Cable Co.	Armco spiral welded steel pipe
American Rolling Mills Co.	Steel cable, wire mesh, welding wire fabric
American Steel & Wire Co.	
Atlantic Steel Co.	Air preheater
Babcock & Wilcox Co.	2 Tomlinson recovery furnaces
	Boilers—1 equipped with Hofft furnace
Badger, E. P., & Sons Co.	Expansion joints
Bailey Meter Co.	Instruments
Baldwin-Southwark Corp.	Baling press
Bethlehem Steel Co.	Steel
Biloxi Grit Co.	Oyster shell
Bingham Pump Co.	Pumps
Bird Machine Co.	Screens
Birmingham Rail & Locomotive Co.	Rails and equipment
Blaw-Knox Co.	4 digesters 11' x 47' over all
Bowser, S. F., & Co.	Oil purifying
Brick & Tile Mfg. Co.	Stack brick
Bridgeport Safety Emery Wheel Co.	Knife grinders
Brown Instrument Co.	Instruments
Chattanooga Boiler & Tank Co.	Breechings
Chapman Valve Mfg. Co.	Valves
Carthage Machine Co.	Knife chippers with cord breakers
Central Forging Co.	
Chicago Bridge & Iron Works	125,000 gallon sprinkler tank
Cooper Alloy Foundry	Stainless steel
Crane Co.	Pipe and fittings
Cutler Hammer, Inc.	Instruments
Coppus-Dennis Eng. Corp.	Gas bruner
DeZurik Shower Co.	Valves
Diamond Power Specialty Corp.	Soot blowers and bi-color water gauges
Dilts Machine Works	6 hydrafiners 1200 RPM
	Broke beater
Dixie Brick Co.	Fire clay
Dodge Mfg. Co.	Transmission equipment
Dorr Co.	Causticizing system
Duriron Co.	Specialty pumps
Dresser, S. R., Mfg. Co.	Couplings
DuPont De Nemours Co.	Paint
Elliott Co.	Twin Feed Water strainers
Elwell Parker Electric Co.	Trucks
Emerson Mfg. Co.	Jordans—2 bronze filled for finishing
Equipment Steel Products Div.	
Fairbanks Co.	Valves
Falk Corp.	Couplings and gear reducers
Faulkner Concrete Pipe Co.	Concrete pipe
Fay, Spofford & Thorndike	Designed several buildings
Fibre Making Processes	Indirect liquor heaters and pumps
Fisher Governor Co.	
Fischer & Porter Co.	Instruments
Fitchburg Screen Plate Co.	Screen plates
Foster Engineering Co.	
Foster Wheeler Corp.	Flash type blow-down condenser
Foxboro Co.	Instruments
Frack-Reid Supply Corp.	Steel rope
Garlock Packing Co.	Packing
Germain Mfg. Co.	Lumber
General Electric Co.	Motors and controls
	Sectional motor drive
	Single motor drive with helper drives
	1—7500 KVA turbine bleeds at 130 lbs.
	Cubicle type controls
General Fire Extinguishers	Sprinklers
Goetze Gasket & Packing Co.	Packing
Golden Anderson Valve Specialty Co.	Valves
Goodrich, B. F., Co.	Conveyor belt
	Rubber covering of rolls
Goulds Pumps, Inc.	Pumps
Greenville Steel & Foundry Co.	
Grinnell Co.	Piping
	Forced ventilation, rubber lined and special piping
Gulf Coast Machine & Supply Co.	Castings
Gulf Foundry & Machine Co.	Heavy lumber
Hallett Mfg. Co.	Feed water treatment
Hall Laboratories, Inc.	Simplex and duplex cutters
Hamblet Machine Co.	Tanks
Hammond Iron Works	No. 1 and No. 2 fire brick
Harbison Walker Refractories	Oil burner
Hauck Mfg. Co.	Alum tanks
Hauser Stander Tank Co.	Valves
Hills McCanna Co.	Agitators
Hill Clutch Machine Fdry. Co.	Furnaces
Hofft, M. A., Co.	Hose
Home Rubber Co.	7—2500 lb. beaters—new design
Horne, J. H., & Sons Co.	Scales
Howe Scale Co.	
Ingersoll Rand Co.	Boiler feed pump
Ingram Day Lumber Co.	Lumber
International Business Machines Corp.	Time clock and tabulating equipment

The Chickasaw Mill

THE HOLLINGSWORTH AND WHITNEY COMPANY

Mobile, Ala.

Constructed By

THE RUST ENGINEERING COMPANY

Pittsburgh, Pa.

Birmingham, Ala. Washington, D. C.

Improved Paper Machinery Corp.	fugal screens 16—14 plate, deckers, toiling screens, 7 thickeners, 3 stage counter—current washing, system 8' x 12' washers, Thorne bleaching equipment, 1—8' x 4' lime sludge filter
	Wood reclaiming conveyor
Jeffrey Mfg. Co.	Jeffrey Conveyor
	Conveyor from bleach plant
	Conveyors for lime and steel tanks
	Transite
Johns-Manville Sales Corp.	Bolts
William H. Haskell Mfg. Co.	
Kelly Axe & Tool Wks.	Rewinders
Kidder Press Co.	Rolling steel doors
Kinnear Mfg. Co.	Chemical stoneware pipe and fittings
Knight, Maurice A., Co.	Pumps
LaBour Pump Co.	Fire brick
LaClede-Christy Clay Products Co.	Winder
Langston, Samuel L., Co.	25 Wells
Layne Central Co.	Instruments
Leeds & Northrup Co.	Steel
Levinson Steel Co.	Gas
Linde Air Products Co.	Roll grinders
Lobdell Car Wheel Co.	Hydrants
Ludlow Valve Mfg. Co.	Instruments
Manning, Maxwell & Moore	Pulp conveyor
Mathews Conveyor Co.	Elevators
Laughlin, Geo. T., Co.	
McGowin-Lyons Hdwe. & Supply Co.	Hardware and cement
	Millwork
McPhillip Mfg. Co.	Weightometer and Rateograph
Merrick Scale Mfg. Co.	
Metal & Thermit Corp.	Cast iron pipe and fittings
M. & H. Valve & Fitting Co.	Dryer drainage
Midwest Fulton Machine Co.	Structural steel and tanks
Mobile Steel Co.	Pumps
Morris Machine Wks.	Tubing and fittings
Mueller Brass Co.	Barking drums
Murray, D. J., Mfg. Co.	2 Cascade evaporators
	Vacuum pumps
Nash Engineering Co.	Cast iron pipe and fittings
National Cast Iron Pipe Co.	Concrete reservoirs
National Gunite Contracting Co.	Tubing
National Tube Co.	Propeller type agitators
Noble & Wood Machine Co.	Rotex chip screens
Orville Simpson Co.	Insulation
Owens-Corning Fiberglass Corp.	Hot water heaters
Patterson-Kelley Co.	
Philadelphia Gear Works	
Pittsburgh Piping & Equipment Co.	Outside water piping
	Glass and putty
Pittsburgh Plate Glass Co.	Valves
William Powell Co.	184" Fourdrinier machine
Pusey & Jones Co.	Beloit suction couch roll
	Stream flow vats
	Slitter and winder
	Gravel and sand
Radcliff Gravel Co.	Valves
Reading Pratt & Cady Div.	Valves
Record Foundry & Machine Co.	Terra cotta pipe
Reliance Equipment Co.	Combustion control
Republic Flow Meters Co.	Instruments
	Ventilation
Ross, J. O. Engineering Corp.	
Ruggles Klingemann Mfg. Co.	Trimmers and knife grinder
Seybold Machine Div.	Paint
Sherwin Williams Paint Co.	Atlas cement
Smith-Kelly Supply Co.	Intra-plant telephone system
Southern Bell Tel. & Tel. Co.	Twistye lumber
Standard Building Material Co.	Tile-lined towers and chests
Stebbins Engineering & Mfg. Co.	Stock tanks
	Tile-lined storage tanks
	Covering of rolls (rubber)
Stowe Woodward Co.	Traps
Strong, Carlisle & Hammond Co.	Forced and induced draft fans
Sturtevant, B. F. Co.	Blowers
Swartwout Co.	6 body quintuple effect evaporators
Swenson Evaporator Co.	Brick
Taylor Brick & Tile Co.	Instruments
Taylor Instrument Co.	Scale
Toledo Scale Co.	Reinforced rods
Tennessee Coal Iron & R.R. Co.	Piles
Telman, R. C.	Slab bolsters sash and mullions
Truscon Steel Co.	General mill supplies
Turner Supply Co.	Anchor bolts
	Rubber covering of rolls
Tyer Rubber Co.	Penn-Dixie cement
Underwood Coal & Supply Co.	Screen plates
Union Screen Plate Co.	Roll covering and conveyor belting
U. S. Rubber Co.	Pumps specialty
Viking Pump Co.	SO_2 handling
Virginia Smelting Co.	
Henry Vogt Machine Co.	8' x 160' Lime kiln
Vulcan Iron Works	Roof drains
Warren Ehret Co.	Chip crusher
Waterville Iron Works	Special reduction units
Watson Flagg Machine Co.	
Watson Stillman Mfg. Co.	
Weatherly Foundry & Machine Co.	
Whiting Corp.	Cranes
Wirt & Knox Co.	Fire fighting equipment
Wil X Mfg. Corp.	
Woodward, Wight Co., Ltd.	
Wood Preserving Co.	Cross and switch ties
Worthington Pump & Machine Co.	Pumps
	Feed water heater
	Air compressor
Yale & Towne Mfg. Co.	Trolley and hoists
Yarnall-Waring Co.	Valves

IMPCO Equipment at Chickasaw

The following is a description of the equipment built especially for the Chickasaw Mills by the Improved Paper Machinery Corporation, Nashua, N. H.:

The calcium carbonate sludge from the recovery plant is washed and thickened over an "IMPCO" 8 foot diameter by 4 foot face sludge filter. This machine is constructed with nickel chromium valve parts to prevent corrosion and erosion from sulphides, and is equipped with a totally enclosed drive, including the drive for the swing agitator in the vat. There are no bearings submerged in the sludge. The machine has special removable washout ports which permit easy access to the drainage channels and the passages to the filter valve for cleanouts.

The brown stock from the digesters is blown to a blow tank with blow down condenser system, etc., and is pumped from there continuously to an "IMPCO" three-stage vacuum washing system. This system is arranged and piped up for operation either three-stage counter-current, or two-stage counter-current with a third washer serving as a "re-washer" and provision is also made for using the stock chests, which normally would follow the washing system, at an intermediate point in order to obtain a soaking or bleaching effect, thereby giving the maximum cleanliness of washed stock. Two vacuum pumps for the washers were provided in the layout, but the washers operate with excellent vacuum without the use of the pumps. An entirely new principle of repulping between stages, and feed to subsequent washers makes it unnecessary to have the former conventional drop between washers, and entirely does away with the foam that was created by this drop and improper repulping.

Accurate control of the system is provided from the operating platform by means of a panel board containing liquid level gauges, flow meters, etc., as well as electrical control. A by-pass system is provided so that any washer can be stopped temporarily without interrupting production.

The stock is screened through a battery of "IMPCO" knotters, riffled, and then screened first through centrifugal screens. Part of the stock from the centrifugal screens may be taken direct to one vacuum decker. The balance is screened over "IMPCO" flat screens with bronze vats, and the accepted stock is thickened over another "IMPCO" vacuum decker.

An "IMPCO" 8 foot by 14 foot vacuum saveall is located on a mezzanine floor in back of the wet end of

FAY, SPOFFORD & THORNDIKE
Engineers
11 BEACON STREET, BOSTON
Investigations Valuations Reports
Designs Engineering Supervision
Commercial Buildings Industrial Plants
River and Harbor Works Fire Protection
Water and Sewerage Systems

THE POWERS COMPANY
Wholesale Paper Dealers
Mobile, Alabama

the new Fourdrinier paper machine to handle the white water. The drive consists of a variable speed direct-current motor, direct-coupled through a reducer to the filter, as is the case of all vacuum filters in the mill. Automatic speed control is provided through float operation of the field rheostat. Recovered stock from the saveall goes directly back to the chest, thereby effecting an immediate recovery of the stock and returning it for re-use without loss at changes.

The Improved Paper Machinery Corporation is agent for the International Pulp Equipment Company, Ltd., design bleach plant at Mobile, and furnished all of the mechanical equipment for high density and low density bleaching vessels, as well as stock chest agitation, and the vacuum pulp washers following each stage. These washers operate in tile vats, and incorporate the new "flow box washing" apparatus (patent applied for) which enables a head of fresh washing water to be held against the pulp sheet during the whole washing cycle on the vacuum machine, thereby giving the maximum washing effect.

Pulp from the bleachery in several degrees of brightness can be pumped directly to the beater room, or stored at high density and delivered from storage as required to "IMPCO" thickeners located in the special room above the beater for furnishing high density stock to the beater.

Masoneilan Control at Chickasaw

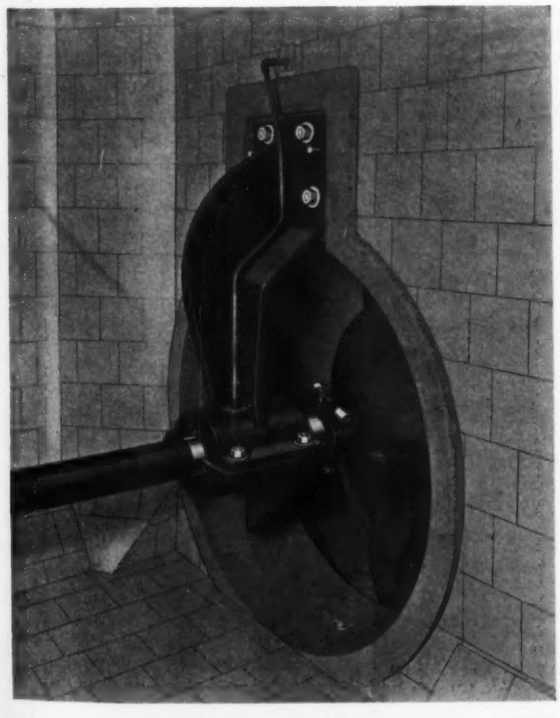
The new Hollingsworth & Whitney mill at Mobile, Ala., has installed Masoneilan controls in practically every department. The water pressure to the desuperheater in the turbine room is controlled by a forged steel single seated No. 35 reducing valve. In this same department a Masoneilan No. 515 regulator controls steam pressure for heating.

In the bleach plant a Masoneilan No. 439 cut-off regulator with manual reset and a Masoneilan No. 40 reducing valve control the flow of Chlorine to the bleach vats.

A Masoneilan No. 2110 recording pressure controller operates an 8 inch No. 38 control valve, reducing steam pressure to the kraft digesters.

One of the Pusey & Jones paper machines is equipped with Masoneilan Exact-a-Load roll load control on the lump breaker roll. This control operates by subtracting the weight of the roll the desired amount and in off position lifts the entire weight of the roll. It utilizes Masoneilan No. 661 diaphragm type load applicators.

Drying controls on the two machines each consist of a Tenso-Temp moisture content controller on the larger section and a No. 3210 recording temperature controller on the smaller section. These controls include a 10 inch and a 6 inch No. 38 control valve respectively in the steam lines to the driers on one machine; and a 12 inch and an 8 inch No. 38 control valve in the steam lines to the driers of the second. The Tenso-Temp control regulates the moisture content in the sheet by throttling the flow of steam in proportion to temperature of the dryer and tension of the sheet. The temperature controls regulate the flow of steam to the last section of driers where the size is dried.



HOLLINGSWORTH & WHITNEY CO.
INSTALLS

NOBLE & WOOD
PROPELLER AGITATORS

In the New Mobile Mill

These Propeller Agitators are running in vertical cylindrical chests with "horseshoe" midfeathers. The chest sizes range from 15'6" to 17'0" diameter by slightly over 11' depth, inside dimensions.

Noble & Wood Propeller Agitators are made for all types and sizes of chests.

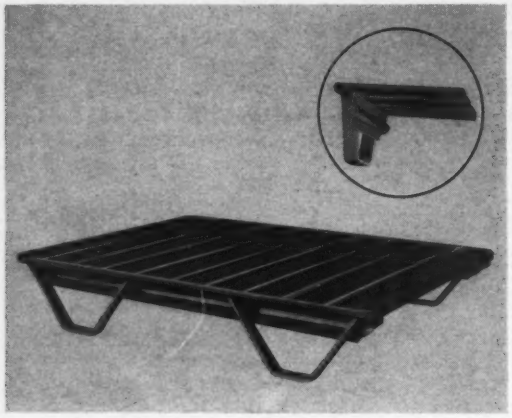
Write for Booklet P. T. 502

The NOBLE & WOOD MACHINE CO.
Pulp and Paper Mill Machinery
HOOSICK FALLS, N. Y.

Service Steelwave Skid Platform

A new line of corrugated metal products tradenamed Steelwave and headed by the new Steelwave Skid Platform has just been placed on the market by the Service Caster and Truck Company, 615 N. Brownswood avenue, Albion, Mich.

Featuring a principle of "Strength Without Weight," the manufacturer lists as advantages (1) greater lightness and strength due to use of light gauge metal corrugated two ways . . . crosswise in the deck and lengthwise at right angles to the deck in the side angles, (2) greater safety to loads and workmen due to rounded corners,, (3) greater resistance to wear from jamming, loading and impact under heavy service, (4) no possibility of swelling, shrinking, warping or buckling from atmospheric conditions, (5) unaffected by standing loads, and (6) no splinters or broken top-boards possible.



New Skid Platform

Steelwave Skids are fabricated from light sheet metal, 16 to 12 gauge, according to required capacity. Deck and side angles are die formed and legs are of 5/16 x 1½ inches flat steel. All parts are permanently fused by electric welding.

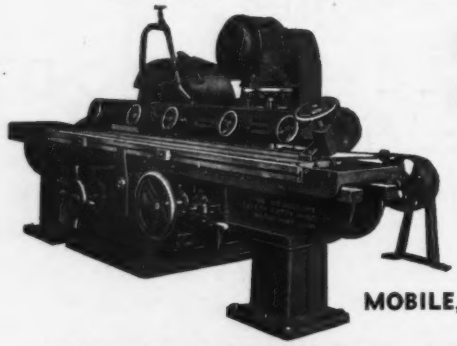
Platform sizes for standard models range from 24 x 42 inches minimum to 36 x 72 inches maximum. Minimum clearance, floor to underside of deck, is 6½ inches, maximum, 12 inches. Either two or four-way lift truck entrance types are furnishable. Two standard capacities 3500 to 5000 pounds, but special sizes and capacities can be custom built.

Other Service Steelwave products include pallets, skid boxes (wheeled and with rigid skid legs) nesting rings and special superstructures for trailers and floor trucks.

Twenty-two New or Modernized Mills Install Stowe-Woodward Rolls

During the past 12 months, more than 22 mills have equipped new or renovated paper machines with Stowe-Woodward rubber covered rolls and Stonite press rolls. These installations include important new construction or modernization projects ranging from Millinocket, Maine, to Longview, Wash., and from Rhinelander, Wis., to Pasadena, Tex.—and even in Havana, Cuba. In several instances, new machines were 100 per cent equipped with Stowe-Woodward coverings as a result of specifications by the mill to the machinery builder.

HOLLINGSWORTH & WHITNEY CO.
CHAMPION PAPER & FIBER CO.



Selected the
BRIDGEPORT HEAVY DUTY KNIFE GRINDER
for their new mill at
MOBILE, ALABAMA

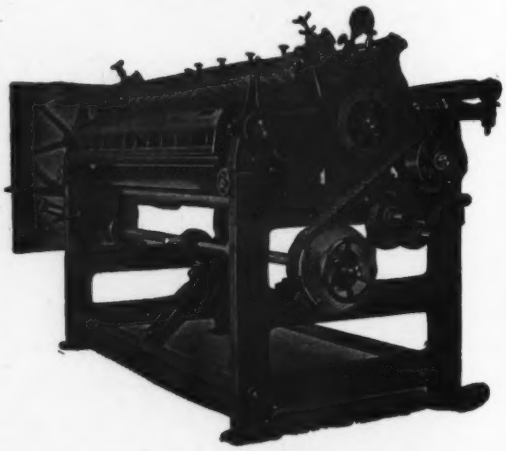
THE BRIDGEPORT SAFETY EMERY WHEEL CO., INC.

Every Dot on the Map Means a Bridgeport Grinder

1302 W. Broad Street
Bridgeport, Conn.

Write us for details

MODEL 28
ROLLER BEARING CUTTER



HAMBLET MACHINE CO.
LAWRENCE, MASS.
MAKERS OF
SINGLE, DUPLEX AND DIAGONAL PAPER CUTTERS.
CUTTER KNIVES. PATENT TOP SLITTERS.

Ontario Paper Co. Spends About $1,000,000 Developing Black River Limits

The Black River Limits pulpwood cutting, barking, and shipping development is the latest addition to the Ontario Paper Company's woodlands undertakings. About $1,000,000 have been invested in this undertaking to date. The barking and shipping plant is located near Heron Bay, Ont.

The establishment of a modern barking and shipping plant was first contemplated in 1934, when the Government of the Province of Ontario urged the company to acquire limits in the region of Lake Superior for the purpose of supplying some proportion of the needs of the Thorold mill. The Ontario Paper Company obtains a large supply of its wood from its limits in the Province of Quebec. It has purchased in the past a substantial quantity of pulpwood from suppliers in the Maritimes and in the Provinces of Quebec and Ontario.

Black River Limits

The timber limit is composed of the watershed of the Black River which lies between the Canadian National Railway near Osawin at the north and Lake Superior near Heron Bay at the south. It is bounded by the White River watershed on the east and the Pic River watershed on the west and contains an area of about 700 square miles.

Due to severe winters and poor rocky soil the upper stretches of the hills are covered with birch, poplar and jackpine with only a scattering of spruce and balsam. The latter species of trees are found in black spruce swamps and the dry lowlands. Small lakes well distributed throughout the whole area provide adequate reservoirs to enable the driving of four foot pulpwood down the small streams to the main river and its branches.

Scheme of Operation

Wood is driven down the main river almost to the mouth of the river where it is tributary to the Pic River and where the main holding boom is located. The barking plant is situated adjacent to this boom and on the west bank of the river.

From the barking plant the wood is conveyed to Lake Superior by means of a flume about three and a half miles in length. Here it can either be loaded directly on to boats for shipment to Thorold, or alternatively can be placed in a natural storage basin which has been created by damming up an arm of Lake Superior. Wood can be reclaimed from the storage basin by means of a jackladder connected to the flume so that the rate of loading onto boats is not dependent on the output of the barking plant but can be regulated to suit the loading crew.

An interesting feature in the shipping angle is the fact that some of the boats that transport the pulpwood make a complete circle tour. Leaving Thorold with a cargo of paper from the Ontario Paper Company's plant, freighters ply to Chicago. Unloading the paper there the boats proceed to Heron Bay light and take on a load of pulpwood for Thorold.

Engineering Studies

Before adopting the scheme above outlined very detailed surveys and studies were made of a number of alternatives. These included schemes requiring the use of floating jackladder equipment for loading directly into boats as well as several alternative projects using a fixed loading wharf. It was found that none of the schemes for using a floating jackladder could be relied on for continuous loading without either the installation of a protective breakwater or alternatively considerable tows on Lake Superior to a sheltered haven where loading could be continued irrespective of storms on the lake.

Initial costs for such schemes were found to be in

the neighborhood of the cost of the wharf schemes and operating costs were found to be quite considerably higher notwithstanding some lack of assurance of continuous uninterrupted operation. This latter feature is of paramount importance to the company when account is taken of the necessity of steady arrival of boats at its unloading facilities at Thorold and also the economical organization of loading crews in a rather isolated part of the country.

At first sight it would appear that the logical method would have been to drive the wood down the Pic River to its mouth in Lake Superior. Observations carried out during several years showed that such a scheme would have been considerably more expensive than the one adopted. The Pic River carries down enormous quantities of silt each year. This silt is deposited at the mouth and at times restricts the depth of the river to only six or seven feet of water. To maintain an open channel into the river suitable for lake boats would have required continuous and expensive dredging as well as large training works. The scheme adopted provides a minimum of 20 feet of water in Heron Bay at a location where there is no risk whatever of silting. It has a further marked advantage in that wood is removed from the Black River before its junction with the Pic and therefore interferes in no way with operations of another company on Pic River.

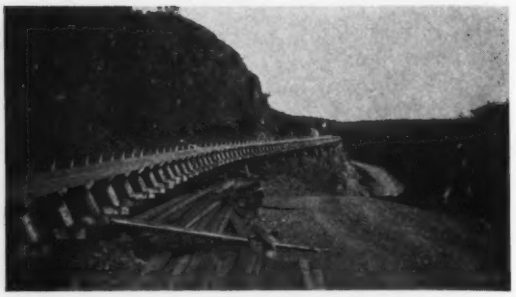
The Barking Mill

The barking plant is intended to consist of two 45 feet long x 12½ feet diameter drums, only one of which has been installed at the present time. This is of the U-bar type in two sections suspended on chains. It is operated at six revolutions per minute by a 150 hp. motor. The rated capacity of the drum is 22 cords per hour but it is equipped with removable channels for adjusting the rate of discharge depending on the ease of barking.

The storage pond for the barking mill is situated mainly up stream from the mill, but the portion of Black River between the mill and Pic River is also utilized for storage. During the summer months Black River is at lake level with no appreciable current. During periods of strong south-west winds the floating wood is carried up stream against the current so that the wood stored below the mill can be utilized at such times when it would be difficult to bring wood down river.

The wood is taken from the water by means of an eight-chain type feeder having C-111 chains with K-2 attachments and spurs every fourth link. This feeder can be adjusted in height to suit varying water

Power House, Penstock and Rough Wood Flume



Flume and Road

levels in the river and delivers onto the main jackladder. It is operated by a 15 hp. motor.

Upon reaching the Black River jackladder, the wood is carried up the river bank for a vertical lift of about 80 feet by means of a two-chain conveyor with C-132 chains and RF-20 attachments every tenth link. This conveyor is 201 feet in length and is operated by a 75 hp. motor. From this jackladder the wood is delivered on to the barking drum feeder which is a four chain conveyor operated by a 15 hp. motor. From the drum, the wood falls onto a sorting conveyor beside which there are recirculation conveyors to take the improperly barked wood back to join the incoming rough wood on its way to the barker. The sorting conveyor is a rubber belt 150 feet long by five wide and operated by a 10 hp. motor. With occasional treatment this belt, judging from past performances of similar ones, should withstand wear and picaroon punches for more than 10 years. The two return conveyors are single chain C-111 with RF-20 attachments every 12th link and are operated by 10 hp. motors.

The accepted logs from the sorting conveyor drop into a chute onto another conveyor, operated by a 50 hp. motor, which elevates them to the flume for conveyance to the wharf.

A compressed air operated splitter is provided for splitting very large logs as it has been found an economy particularly at the receiving end to reduce the size of such logs. Cleaning of the wood is facilitated by means of an electrically operated "woodpecker."

Flume is of V Type

The flume is of the V-type and is constructed of 2" thick shiplap spruce and jackpine untreated lumber. The trough has a vertical height of 22" and is 4 feet wide at the top. Water flowing through the trough reaches a normal height of about 18 inches. The minimum grade of the flume is 0.3 per cent and the maximum grade 5 per cent. On steep slopes the inside of the flume is protected from undue wear by means of plate steel lining.

The terrain over which the flume is built is very variable consisting in part of muskeg, in part of clay soil and elsewhere solid rock. In the muskeg sections the flume is supported on Creosoted sills and creosoted jackpine piles driven well below frost level. Elsewhere footings consist of small rock filled cribs, or the flume is built directly on rock.

The flume is supplied with water by means of a single 7500 gallons per minute centrifugal pump situated on the bank of the Black River and driven by means of a 250 hp. electric motor. Water is delivered to the flume by means of an 18" diameter woodstave pipe through a vertical rise of about 80 feet.

To the west of the Pic River the flume runs out of elevation and logs are raised through a vertical height of about 50 feet by means of a jackladder which is conveniently located on a rock outcrop. This jackladder is 172 feet in length, has C-132 chain with RF-20 attachments every 10th link being similar to the haul up to the flume at the barking drum site. Water from the flume passes into a concrete sump and is pumped back into the continuation of the flume by means of a centrifugal pump.

The flume is carried across Pic River by means of a steel suspension bridge having a clear span of 288 feet from center to center of towers. This bridge is stiffened by means of steel trusses which limit the defiction under varying temperature and load conditions so that the flume can be operated without any undue hazard of log jams over the bridge. The structure is anchored to massive concrete blocks on each side of the river.

A short distance from the wharf are situated three chutes leading from the flume to the storage pond. When the wood is not needed for a boat it is shot into the storage pond 35 feet below where it is kept until needed for loading a boat. When needed the logs are transported up a two-chain conveyor 175 feet in length which lifts the wood up onto the flume. This conveyor has C-111 chains with RF-20 attachments every 12th link.

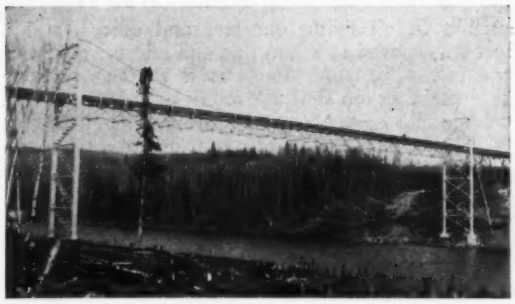
The log storage pond is a natural one, 400 feet by 300 feet in size. The deepest part is seven feet and it has a capacity of approximately 15,000 cords of stacked wood.

When a vessel is being loaded the wood from the barker goes the full length of the flume to the wharf where it is dropped into the vessel from chutes at the side of the flume. There are six of these chutes so placed that each is suspended over the hatch of a vessel.

The Loading Wharf

The loading wharf in Lake Superior is located on the west side of Heron Bay so as to receive considerable shelter from a series of small rocky islands which protect the wharf against the full sweep of the lake. It is constructed on a foundation of fine lake silt which has a minimum depth over bed rock of 12 feet. After carefully studying alternative types it was decided that a steel sheet pile structure with rock filling between the sheeting would best suit the conditions. The piling was driven from a wooden pile bent structure which was first driven between the lines of steel sheeting. This wooden structure was used not only to support the pile driver during construction but was also designed for incorporation in the completed work. The interior of the wharf between the lines of sheet piling was entirely filled with heavy rock filling the total amount of which is over 9000 cubic yards. The total length of the wharf including the timber crib approach section is approximately 300 feet. The depth of water alongside the wharf ranges from 23 feet to 27 feet.

Log Pond Showing Flume and Jackladder



Flume Suspension Bridge

A rock reef situated in the approach to the wharf and which limited the depth over a small area of 14 to 15 feet has during the past summer been removed by the Department of Public Works thus giving a clear approach under all conditions, having a depth of not less than 20 feet.

The Hydro Electric Plant

Electric power for the Heron Bay project is generated by means of a hydro electric plant which has been constructed at Black River Falls about two miles north-east of the barking plant. At this site the Black River descends through a series of falls and cascades, in a very short distance, about 150 feet. The present plant utilizes about one-half the head, that is 75 feet, available at the falls and develops 1500 hp. which is adequate for all present purposes. The site lent itself to construction of a single and economical development. Water is lead from a low concrete dam to the power house by means of a wood-stave pipe 6 feet in diameter and approximately 400 feet long.

The turbine is of the double horizontal "Francis" type in a steel plate casing. The speed is 514 rpm. The generator is rated 1450 KVA. 6800 volts, 3 phase 60 cycles. There is no surge tank but speed regulation is assisted by means of a heavy fly wheel mounted between the turbine and the generator. Voltage is controlled by means of an automatic voltage regulator.

By generating at 6800 volts the need of transformers at the generating plant was eliminated and this voltage is used throughout for the high tension transmission system.

Two dwellings adjacent to the power site have been provided as power house operators living quarters.

Heron Bay South

The company's townsite, known officially as Heron Bay South, and built for the accommodation of employees of the plant, is situated about one and a half miles from the railroad tracks at Heron Bay station.

Included in the settlement are the three-story staff house, the manager's residence, a number of operator's dwellings, the infirmary, company office, stores department, machine shop, garage, stable and bunk houses for other employees. Comfort and sturdiness to withstand the severe winters went into the con-

struction of all living quarters and offices, and no effort was spared to attain this end and to make them attractive. The staff house is a three-story structure containing ten sleeping rooms and dormitories to accommodate 75 men. The infirmary has a capacity of six beds, with medicine room, doctor's office, and attendants' quarters. It is equipped with all the modern conveniences for the care of the sick or injured.

The town has complete public services such as electricity, water supply, and sewer system. The drinking water is obtained from the Pic River and is filtered and chlorinated. Sewage is handled by means of a septic tank followed by disposal beds.

The Roads

About eight miles of roads were constructed connecting the power development and barking mill with Heron Bay South, Heron Bay station and the wharf. Owing to the fact that much of the ground is swampy a corduroy road in many places was first constructed and then filled in with gravel. Excellent gravel for road construction was obtained from a pit north of Heron Bay Station.

Construction

From the construction angle the undertaking was found to fall into four distinct subdivisions:

1st—Construction of roads, flumes, jackladders and timber structures at the barking mill. The company's own Woods Department forces who had recently completed a very large programme of work on these lines at Baie Comeau, Quebec, were well qualified and organized to carry out this section of the work, which accordingly was done under the direct supervision of Mr. J. G. Girard, the Company's logging engineer.

2nd—Structural work connected with the power development, barking mill, townsite buildings, water supply and sewerage system, also the power transmission system. This part of the work was let out for tender, the successful bidder being Messrs. Angus Robertson Limited of Montreal.

3rd—The loading wharf on Lake Superior. This, as a distinct section of the work, was let out for tender, the successful bidder being Messrs. Aiken and MacLachlan of St. Catharines, Ontario.

4th—Installation of all mechanical and electrical equipment. This was carried out by the company's Heron Bay Operating Department.

Racquette River Plans To Hold Jobs

[FROM OUR REGULAR CORRESPONDENT]

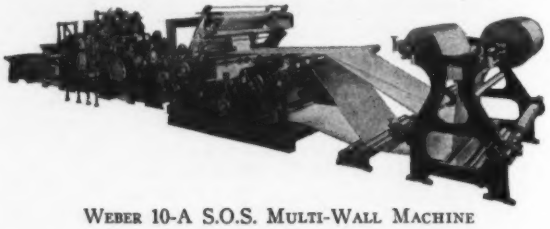
POTSDAM, N. Y., November 18, 1940—Announcement is made by the Racquette River Paper Company that it plans to hold open the jobs of any of its employees of draft age who are called for military training. The concern also will pay his group life insurance premium during his term of service, allow him a month's pay upon his induction and also pay him $25 when he returns to the service of the company. An official of the concern informed the employees that those called would retain their status with the firm if they returned to the company within forty days after their military service ended. Those hired as replacements will be informed that their jobs may be temporary and that the men may be subject to demotion, transfer or release.

Largest Bag Equipment in World

The trend to paper bags from cotton and textile bags in general has received a further boost or impetus by reason of the development of large S.O.S. equipment which heretofore has not been available for the manufacture of S.O.S. bags beyond a limited size.

H. G. Weber & Co., Inc., has recently developed and patented S.O.S. paper bag equipment which is believed to be the largest equipment of its kind in the world for manufacturing extremely large multi-wall S.O.S. bags.

The large S.O.S. bag machinery, undoubtedly, will not only result in a further accentuation in the change from textile to paper in the larger sizes, but it will also be responsible to a certain extent for a shift to the S.O.S. style of bag from the satchel bottom or sack style of paper bag in the larger sizes.



WEBER 10-A S.O.S. MULTI-WALL MACHINE

It has been possible in the past to produce sacks or satchel bottom bags in much larger sizes than the self-opening style bags as it had not been considered practicable to design S.O.S. equipment for the production of large multi-wall S.O.S. bags. The general design and principles of the various operations of Weber S.O.S. machinery, particularly the rotary cut-off, is well adapted for this equipment to be extended in range to include the larger sizes of multi-wall bags.

The rotary cut-off on the machine illustrated on this page is capable of cutting four plies of paper totaling two hundred and forty pounds basis weight. It must be remembered that a combined basis weight of two hundred and forty pounds in an S.O.S. or gusset tube is actually nine hundred and sixty pounds that must be cut. The cut-off is accomplished with the usual smoothness of operation and lack of vibration and noise for which Weber equipment is noted.

H. G. Weber & Co., Inc., reports that there is a great demand for this type of equipment for large S.O.S. bags which incidentally is capable of converting approximately twelve tons of paper per eight hour day.

Paper Stock Market Slow

PHILADELPHIA, Pa., November 25, 1940—Heretofore the month of November for waste paper merchants has usually been one of the best months in the year, one of the reasons advanced being the activity of the board mills getting their orders off for the Christmas trade. However, with the month of November this year almost gone, virtual stagnation continues in the paper stock market for all the cheaper grades, but there is real satisfaction among the packers, that there has been no recession in quotations on the better grades like soft whites and allied lines. Kraft paper, No. 1 mixed, straw board chip and binders Board chip have been marked down this week, with hardly a reportable demand for these grades from the mills.

A Modern Paper Machine Drive

Speaking recently before the New York-Canadian division of the American Paper and Pulp Mill Superintendents Association on "A Modern Machine Drive," Allen A. Lowe of the Sandy Hill Iron and Brass Works traced in an interesting manner the steps in the early development of the drive. It was, according to the speaker, a marvellous step in advance of former methods when Mr. Marshall in 1870, at the old Montague Mill at Turners Falls, Mass., introduced the Marshall train.

The cone pulleys gave the draws, the line shaft kept the inter-relation constant, and the beveled gears turned the corner. It was a great idea because for fifty years the Marshall train satisfied the paper maker's requirements as he brought his stock preparation, sheet formation and drying, up to 800 feet per minute. But there it stuck.

Old Marshall Train Has Faults

There were present in the old Marshall train certain faults. These were principally located in the beveled gear corner. The cast iron or cast steel teeth wore. The bearings became loose. The gears were hard to lubricate. There were present a number of flat belts with the usual belt troubles. The cast iron pulleys gave little trouble but the problem of space was always present. The line shaft had to be located far enough from the Marshall train shaft to give proper belt centers.

Some of these faults were corrected in part. The wood-filled gear gave relief from backlash without the cost of replacing the whole gear. Belts and bearings were improved. Sturdier design of stands and bases was introduced. Marshall trains with wood-filled gears—especially those kept in good condition—are still running and driving machines at high speeds. But the cost of maintenance is considerable and the loss of power through inefficient transmission is an important drawback.

Substitute Drives Possessed Merit

In the meantime, a number of substitutes for the Marshall train itself and for the beveled gear corner were tried. The sectional electric drive was one notable success. Perhaps it is the proper equipment to use with very wide and very fast machines. Many mills have avoided it because of high first cost and the need of expensive supervision.

Another substitute was the rope drive, with ropes parallel to the machine. Still another was the quarter turn belt drive. Both of these continued to use the cone pulleys and occupied even more space than the standard Marshall train. With the invention of narrow clearance steel gears, heat treated and intended to run in oil, came the first step toward the modern paper machine drive. These gears were of the right angled reduction type and took the place of the beveled gear corner. Anti-friction bearings were available now and highly efficient clutches.

Modern corner drives as they have been offered to the paper mills in recent years were designed with these improvements present. Most of the old faults of the Marshall train were overcome. But the cone pulleys were still necessary and the space requirement still considerable.

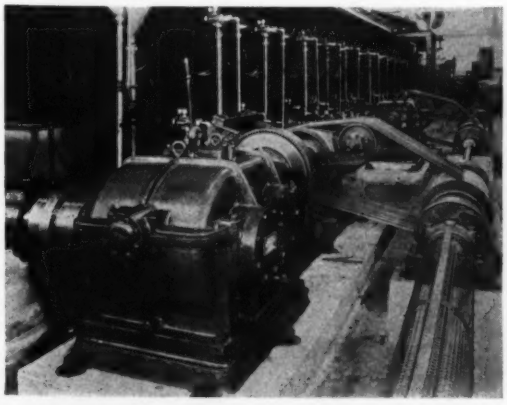
Sandy Hill Drive Important Improvement

Now the Sandy Hill Iron and Brass Works offers a drive which goes a step further. Incorporating the variable pitch V-belt in the drive to take the place of the cone pulleys, the space requirement is brought nearly to an irreducible minimum. It is no longer necessary to occupy valuable space in a basement or set a line shaft on an expensive structure of steel. The prime mover and the line shaft may now be placed on the machine room floor.

The Sandy Hill selective drive is set up as follows: It is based on the Sandy Hill hypoid corner drive. Heat treated, narrow-clearance steel gears running in oil are enclosed in a substantial cast iron case. This gear unit is the rock on which the drive is based. Each gear is carried on a shaft which runs from side to side of the case supported in anti-friction bearings. It is difficult to see how anything can cause misalignment and improper meshing of the gears. A cut-off coupling is used. The shaft carrying the stationary sheave is supported on two anti-friction bearings. All of the foregoing is mounted on a substantial cast iron base. As a whole, it presents a sturdy, practically frictionless corner drive.

New Features in Sandy Hill Drive

The new feature introduced by Sandy Hill is the use of variable pitch V-belt sheaves to give the variation in draws at the sections. The use of V-belts reduces the required distance between corner and line shaft to a minimum and so takes the line shaft out of the basement, or off of a steel structure in the machine room. The use of V-belts has several by-products not involved in the economy of space. It does away with flat belts and the nuisance of slippage, taking up and breaking. It permits twice the adjustable draw range of the standard cone pulley setup. The draw is also steadier and more precisely controlled. On cone pulleys the belt shifter controls the belt running over the nearest pulley, but there can be some variation on the more distant pulley. The speed of the line shaft on this installation is normally higher, permitting the use of smaller line shafting.



THE SANDY HILL DRIVE

Some of the points worth noting are as follows: The vari-pitch sheaves are made interchangeable and integral with the line shaft. The idler arms are controlled and cushioned by shock absorbers. One feature is the adjustment of draws from the front side of the machine by remote control electric units. The factor of safety is such that if one V-belt breaks it is not necessary to replace it until convenient.

The combination of V-belt drive with anti-friction bearings and hypoid gears running in oil, makes a drive which would have amazed Mr. Marshall, as much as his train pleased the paper makers of his time. Another by-product of the drive is ease of inspection and supervision. Everything is on one floor and, in general, week-to-week attention to lubrication is sufficient, instead of day-to-day or shift-to-shift, as is sometimes the case in the older types of drive. Visual oil gauges show the oiler or mechanic the condition of the oil in the gear cases.

Maintenance of Modern Drive Simplified

An advantage of the Sandy Hill drive is that understanding of all its parts and their replacement and adjustment is within the scope of the usual competent millwright present in every paper mill. Frequent replacement or adjustment are not anticipated but when the emergency arises it is not necessary to call in an expert or employ one that he may be available in an emergency. First cost of the complete drive for a machine is favorably comparable to the cost of a complete drive of the older mechanical type and distinctly favorable compared to a sectional electric installation.

To recapitulate the advantages roughly, the economies are in the following: (1) Capital investment. (2) Floor space. (3) Friction load. (4) Lubricants. (5) Maintenance. (6) Shutdowns. (7) Man hour supervision.

A 120-inch machine operating at about 600 feet per minute is running full time with this drive and has been running this way since its recent startup. This is an economical, smoothly operating piece of equipment. It is quite possible that with it many paper makers will make steps in advance in production which seem always to have accompanied radical movements in paper machine drives.

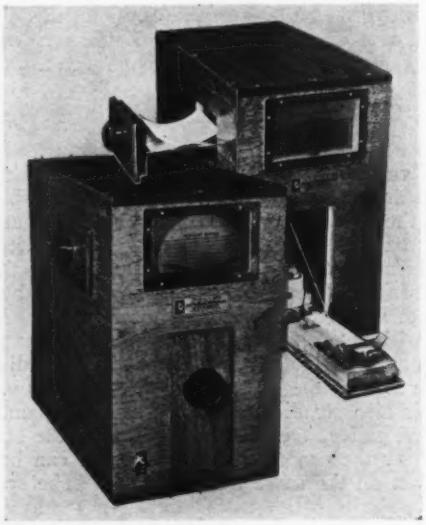
Gurley-Witham Curl and Shrinkage Tester

This new tester indicates paper which has a tendency to curl when dried, and measures paper shrinkage. It is designed in accordance with the suggestions of G. S. Witham Jr., a paper maker of many years' experience, and co-author of the book "Modern Pulp and Paper Making."

Curl Test

The tendency of paper to curl when dried or moistened is a familiar reaction. It is troublesome in any paper which is to be converted, and although it may happen at any time, it is most noticeable when hot, dry conditions prevail in converting plants.

Paper curl is usually due to tension resulting from the two sides expanding unequally. This may be caused by unequal distribution of moisture through the sheet, or by differences in the formation of the two sides, or a combination of both.



New Curl and Shrinkage Tester

The instrument demonstrates this tension by drying a sample rapidly, causing it to curl if it has a tendency to do so. A 4-inch sample is placed upon a heated metal plate and pushed into the path of parallel rays of light. If the sample curls, its shadow is cast upon a translucent screen, ruled and numbered, where it is read. The test requires only about 30 seconds. The instrument may be set up at the dry end of the paper machine, or used in the laboratory.

Shrinkage Test

"Out-of-register" is probably the most common trouble experienced by printers. Misregister due to paper expansion has received much attention with the increased use of wet printing methods. Paper shrinkage is also a cause of misregister, however, since it averages about 0.5 per cent when the paper is dried from 50 per cent to 15 per cent relative humidity. Paper shrinks not only when exposed to dry air, but in many printing processes is passed over gas jets to dry the ink.

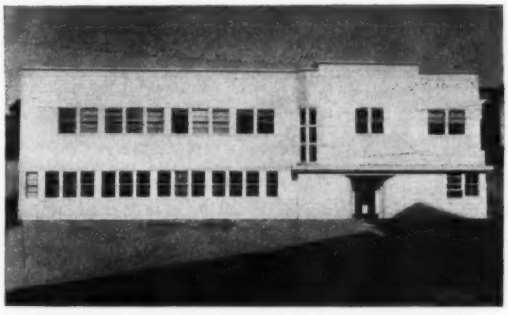
The Gurley-Witham Curl and Shrinkage Tester measures paper shrinkage by drying a sample strip which is used to support a clamp resting on a lever arm. A pointer extends from the other end of the lever arm, the shadow of which is cast upon the translucent scale used in the curl test. As the paper strip shortens in drying, it allows the pointer to move across the scale, which is divided to 0.1 per cent for a total of 4 per cent shrinkage.

The instrument consists of a mahogany cabinet, containing electric heating coils and thermostat for maintaining a temperature of 120 deg. F. within it. Light is projected from a point source through a collimating lens. Both curl and shrinkage are read on the same illuminated scale, and both tests may be carried on simultaneously. As no parallax occurs, readings are made with great accuracy from any position.

Powell River Co. Installs Flakt Drier

Two years ago improved facilities for the production of high grade sulphite pulp were initiated by the Powell River Company Ltd., at its plant at Powell River, B. C., and towards this end flat screens and a Kamyr wet machine were installed to produce a clean pulp in sheets of 50 per cent A.D. The Kamyr is 120 inches wide and has a daily capacity of 100 tons A.D. sulphite pulp. The building erected to house the Kamyr machine was originally designed to take care of driers, for the purpose of producing sheets up to 100 per cent A.D., and early this year a new Flakt drier was installed. The Kamyr wet machine and the Flakt drier, both of which are of Swedish design, were manufactured in Canada, having been made almost entirely by Canada Iron Foundries Ltd., of Three Rivers, Quebec. In addition to the Flakt drier a 600-ton Southwark baling press and various pieces of handling equipment were installed.

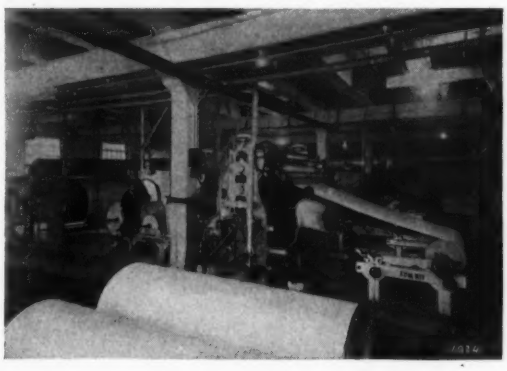
The Flakt drier is 90 feet in length, 16 feet wide and 17 feet in height. The drier itself is divided into



Central Laboratory

eleven horizontal sections by floors of sheet steel and it is equipped with steel radiators. The sheet is dried by means of hot air that is forced through the sections of the drier and temperatures are maintained by means of the radiators. The sheet is carried through the sections on chain conveyors. The hook-up includes an economizer for warming the air supply, in addition to which a certain amount of hot water is provided that is used for warming the sheet at the wet end for purpose of improving the pressing.

A circulating system was installed on the No. 5 digester. This installation was made by the Portland Electric Steel Company, of Portland, Oregon, and allows of circulating about 4500 U.S. gallons per minute through the digester. The digester is 14 feet 7 inches by 49 feet and has a space capacity of 7,000

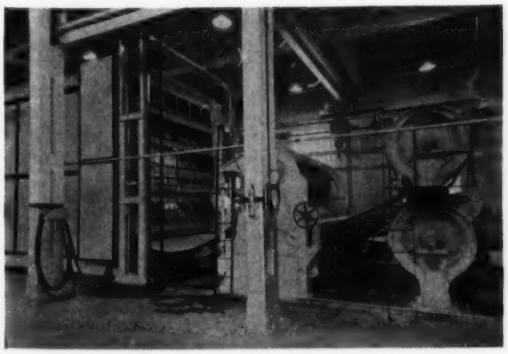


Laminating Machine

cubic feet. Presently direct steaming is the practice, but allowance has been made for the installation of a heater so that the digester contents may be heated by indirect steaming.

A laminating machine, consisting of a coating and combining unit, manufactured by the John Waldron Company and of their latest design, was installed. This machine will take sheets up to 88 inches in width and will allow of the manufacture of asphalt laminated sheets of various grades.

During the year a new central laboratory was built. Architects for the building were McCarter & Nairne of Vancouver. The building is of two floors, covering 50 feet by 85 feet. Modern conveniences, making for utility and comfort, are installed throughout the building, indirect lighting, constant temperature hot water supply, air conditioning, etc. On the main floor are located rooms for pulp testing, statistical, work and store rooms. The pulp testing room is equipped with two sets of British sheet machine apparatus, miniature Valley beater, Bauer-McNeet classification apparatus, Somerville classification apparatus and Canadian standard freeness equipment. There is a constant humidity room with equipment that will allow for either 50 or 65 per cent relative humidity.



Sulphite Sheet Pulp Plant Kamyr Predrier, 2nd Press and Flakt Drier.

Sulphite Sheet Pulp Plant Flakt Drier and Sheet Cutters.

Hydraulic Coupling Occupies New Role of Importance in Paper Mills

The great strides forward being taken by the paper industry in improving production facilities to reduce operating and maintenance expense and hold costs down in the face of rising materials prices, has given the hydraulic coupling (also known as fluid drive) a new role of importance in paper mill equipment.

Similar in principle to the automotive fluid drive, the American Blower variable speed hydraulic coupling employed in one of the latest paper mill installations, provides smooth transmission of torque without any mechanical connection between driving and driven members. The hydraulic coupling also provides "stepless" variable speed control, is readily adaptable to automatic control, permits use of simple, constant speed driving motors, eliminates starting shocks, saves power, and, in the case at hand, substantially reduced the necessary original investment in other equipment.

Close Speed Regulation Essential

The main drive of a paper machine requires extremely close speed regulation to secure a uniform grade of paper. At present many paper companies on their latest machines are using sectional drives with D.C. motors to regulate the draw between sections. In some mills and on earlier installations, a single D.C. motor drives the entire machine through a countershaft from which the individual drives are taken by belts running on cone pulleys.

The experience in one mill has shown the plant engineers that they can make excellent paper using simply an A.C. motor and American Blower variable speed hydraulic coupling to drive the countershaft. Before the hydraulic coupling was installed, the engineers were faced with a worn out steam engine which either had to be entirely rebuilt or replaced with an electrical drive. The D.C. drive called for an investment in a motor generator set or a steam D.C. generator. Further investigation revealed that the hydraulic coupling with an A.C. motor was suitable for their drive and that it would produce a large saving in first cost.

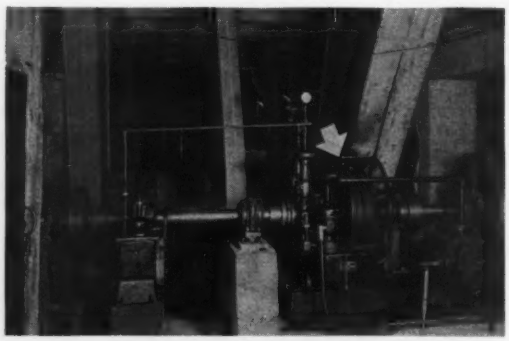


FIG. 1

An American Blower Size 27 Class II Variable Speed Hydraulic Coupling with a 150 h.p. Synchronous Motor Driving a Paper Machine Is Shown Above. In the Background, the Belt Take-Offs to the Various Sections of the Machine Are Shown. These Are on a Countershaft Which Is Driven by a Silent Chain from the Hydraulic Coupling Output Shaft. Also Notice the Control Valves in the Center of the Photo above the Manifold; These Control Valves Hold the Speed of the Countershaft Constant by Metering the Oil in the Hydraulic Coupling to Suit the Load.

Fluid Drive Has Automatic Control

The accuracy of speed regulation after six months of almost continuous operation of the machine is unchanged. The control manufacturers guaranteed 1% and did even better. Tachometer control maintains the paper speed where the operator sets it. Any load fluctuations are automatically compensated for by adding and removing oil from the hydraulic coupling through valves. Other reliable control manufacturers have successful experience with hydraulic couplings under fluctuating load conditions.

The hydraulic coupling is suited to the single motor drive because of its "stepless" speed regulation and lack of mechanical connection, reducing maintenance to a minimum. The complete simplicity of the electrical system is evident since only an A.C. motor and starting equipment is needed; a synchronous motor, with no load starting, can be used to improve the power factor in the mill.

A Successful Record

While the hydraulic coupling or fluid drive is new in the field of paper making, its record has been remarkably successful and every installation increases the rapidly growing acceptance by engineers and mill superintendents.

To Control Pulp Production

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., November 27, 1940—Rigid control of production was decided upon at a meeting recently held in Stockholm by representatives of wood pulp producers in Sweden, Finland, Norway, Germany, and the former Austria and Czechoslovakia. Exports of each mill, as well as all countries represented, will be on a quota basis. Prices will be decided by committees of representatives of each exporting country.

Agreement has already been reached on the allotments for shipment to Belgium and the Netherlands during the last four months of 1940. The former has been allocated 12,000 metric tons of sulphite, of which one-third will be shipped by Swedish mills, one-third by German mills, and the remainder by mills represented in the cartel. Belgium has been allocated 18,000 tons, apportioned similarly between Swedish, German, and other mills. Both countries will receive 11,000 tons each of sulphate pulp, of which Sweden will supply 5,000 tons, Germany, 3,000 tons, and other countries together 3,000 tons. No decision had been reached concerning France, but its requirements during the remainder of the current year are estimated at 100,000 tons of all kinds of pulp. The amount to be shipped to Italy had not been definitely set, but it was decided prices were to be about the same as those quoted on the contracts last concluded.

Hummel-Ross Make Improvements At Its Hopewell, Va., Plant

A general and quite extensive improvement program has been in progress this year at the plant of the Hummel-Ross Fibre Corporation, Hopewell, Va. It includes not only major additions but also numerous minor items. Among them is the erection of an attractive lunch room to serve the executives and foreman of the company.

The wood room has been completely brought up to date, with the installation of new screens and the addition of two new chippers. These new chippers are of the 12 blade, high capacity type and were made by the Carthage Machine Company.

An important addition to the steam generating equipment has been completed by the installation of a bark burning boiler, by the Babcock & Wilcox Company. This boiler has a daily capacity of over 1,000,000 pounds of steam.

A new Babcock & Wilcox black liquor recovery unity was installed and scheduled to be ready for operation on November 1. This unit has a daily capacity of 175 tons and should have a producing capacity of 1,500,000 pounds of steam a day.

Several minor improvements have been made in the cylinder machine room this year. These include a new suction press roll, a new save-all and a new hood over the machine.

In the Fourdrinier machine room a new Pusey & Jones wet end has been installed, which has a considerably longer wire than the one formerly in use.

To increase washing capacity, a new vacuum type washing unit, made by the Improved Machinery Company, has been installed.

In the power house, a 3,000 K.W. Allis-Chalmers turbine has been installed and also an additional superheater.

A substantial increase in the company's storage facilities has been provided by the erection of a warehouse with a capacity of 4,000 tons of board, paper or pulp. A new No. 18, 127-inch Camachine winder has been set up in this new structure. With this addition the company expects to be able to give its customers complete service in periods when business is heavy and it is sometimes difficult for mills to promptly handle orders.

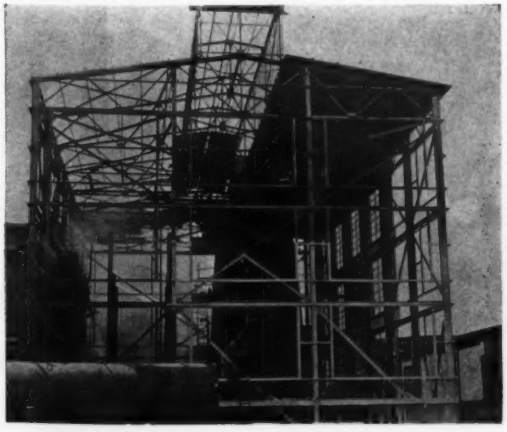


FIG. 1
New Waste Heat Boiler House Under Construction.

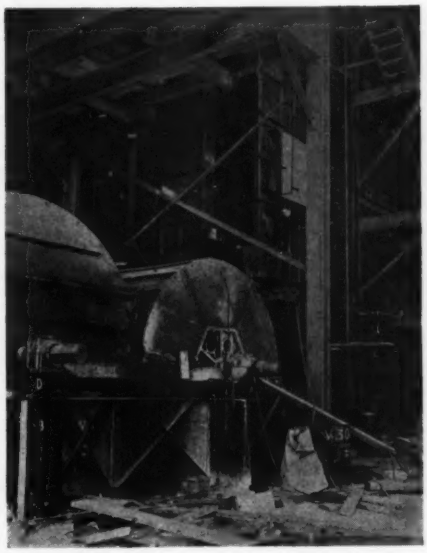


FIG. 2
View of the 175 Ton B & W Black Liquor Recovery Unit Under Construction.

Issue New Kennedy Valve Catalog

A 240-page letter-size cloth-bound catalog on valves, pipe fittings and fire hydrants, just published by the Kennedy Valve Manufacturing Company, is an exceptionally complete presentation of data on bronze and iron-body valves for low-standard, and higher pressures, standard bronze and malleable-iron screwed fittings, standard cast-iron flanged fittings and flanges, fire hydrants, and various valve specialties.

The catalog is characterized by large illustrations throughout, and has several unique features for convenience in use. For example, in the section on iron-body valves, dimensions and prices of valves and accessories are all on facing pages, thereby minimizing cross references to other pages.

A section of the catalog is devoted to descriptions of valve accessories for various operating conditions. Additional features of the catalog are recommendations for the selection of valves and fittings, suggestions for operation, care and maintenance of valves, and much useful engineering data. Five indexes, and tabulations of references on all pages of listings and dimensions, greatly facilitate the use of the catalog in quickly finding desired information.

Copies of the catalog can be obtained by writing the Kennedy Valve Manufacturing Company, 1187 East Water street, Elmira, N. Y., on company stationery, and asking for Catalog 63.

Pioneering With pH Control in Paper Industry

By F. L. LaMotte, LaMotte Chemical Products Co.

Older mill men will recall the early days when pH was first applied to the white water problem. This was prior to 1925. In those times the loss each year of valuable materials in the white water in the United States amounted to many millions of dollars, according to conservative estimate. These losses included fiber, filling materials, and other recoverable by-products. The possibility of applying pH control to the white water problem received great impetus from reports of the success of pH control, as applied to the purification of raw water for drinking purposes, wherein it was established that definite optimum pH levels could be maintained for maximum efficiency in the coagulation and settling operations. The LaMotte research department collaborated with mill chemists in this early work and beginning with meager information and simple pH apparatus it was evident that one of the toughest economic mill problems could be readily solved, and at the same time the hazard of stream pollution eliminated.

With success in the routine treatment of white water interesting articles began to appear in the technical journals, and by 1926 to 1928 it was indicated that mills everywhere had jumped at the opportunity afforded by the advent of this new instrument, pH control. From white water the method was applied to the sizing operation. The sizing agent, which was usually rosin soap prepared from rosin and soda ash, was precipitated by means of alum. If too little alum was used the size was not completely precipitated. On the other hand, the use of excess alum not only added to the cost of manufacture, but exhibited a harmful effect on the paper, and caused corrosion of the equipment.

To apply pH control, experimental work was carried out in the beaters and other steps in the process likely to effect great waste and uncertainty. By persistent efforts this phase of paper making soon came to be a thoroughly standardized procedure, and optimum pH values were established at the various mills, depending upon such local factors as hardness of water, degree of sizing desired, etc.

The introduction of principles of physical and colloidal chemistry in many departments of the paper mill brought pH measurements into the realm of definite necessities. The early LaMotte apparatus was effective principally because of the ease with which it could be operated in the plant. Once optimum values had been established, the technic was sufficiently simple to permit the operator to promptly adjust the pH of the medium under his supervision.

pH Control Becomes Commonplace

By 1927 pH control had become commonplace in the standardization of the processing of pulp and paper. Studies of problems somewhat off the main line of operations were expedited by pH measurements. Elimination of pitch sticking to the wires, press rolls and felts was largely possible because of the information obtained through pH studies. The regulation of sulphite digestion was standardized without difficulty, partly through the use of pH control. The pH value of paper stocks was found to be an important factor in filling, coating and coloring, since it has a great influence on the retention of fillers and color, and duplication of specific qualities and colors was extremely difficult before the application of the pH measurements.

By 1930 pH control found its way into the allied industries using paper. In printing establishments pH tests on paper were found to be of great value in obtaining maximum efficiency in ink response and stability for special jobs. It is known that the pH value of high grade papers has an important bearing on their ultimate keeping qualities.

Improvements in Control

Throughout these years of development and perseverance in the pulp and paper industry great improvements have been made in control instruments and control procedures. It is interesting, however, to note that the ground work established by the original LaMotte equipment still forms the basis for optimum conditions which are now maintained in the standard processing of pulp and paper. The young man entering upon his employment in the paper mill of today accepts the routine of pH control as readily as steam pressure regulation. To him it is a part of the job of paper making to know his pH technic and yet it has hardly been twenty years since this system of control first saw the light of practical application.

Barrel and Drum Tipper

The Lewis-Shepard Sales Corporation, 295 Walnut street, Watertown, Mass., has developed a new device for the safer handling of barrels and drums. This simple but practical tipper consists of a strong handle with a pronged collar which is adjustable. This adjustable collar allows the tipper to fit all types of drums and large or small-bilged barrels. Its job is to make quick and easy and safe the job of tipping barrels from a horizontal to vertical position or the reverse.

The long handle increases the leverage so that much less effort is required to handle barrels or drums than in the ordinary manner without the tipper.

This is the latest addition to the Lewis-Shepard line of safety handling equipment. Lewis-Shepard specific purpose equipment is the result of over twenty-five years experience in research, design and manufacturing. They are also the manufacturers of Master JackLift elevating trucks; Stackers (portable elevators, electric and hand power), arc-welded, steel-bound skid platforms with 11% wood tops; factory floor trucks and scores of adaptations of their standard equipment to formerly unsolved handling problems.

A Modern Mechanical Oil Relay Governor For Steam Turbines That Drive Paper Machines

By Manious Gottlieb, Industrial Turbine Design Engineer, Westinghouse Electric & Manufacturing Co.

For the economical production of paper of uniform weight, color, dryness, and strength, it is necessary that the paper-machine-drive be equipped with a governor capable of maintaining constant speed over a wide speed range. To this end, a wide speed range governor was developed by Westinghouse to hold the speed constant regardless of moderate changes in load and steam conditions. This simple, yet reliable governor has proved to be an important factor in producing quality paper.

Effective Load Not Always Constant

Although the paper machine, in itself, has a constant torque characteristic and aids the control performance through its large fly-wheel effect, the effective load on the machine drive is not always constant. The steam turbine drives for paper machines invariably have low heat drops, i.e., the steam conditions are a relatively low throttle pressure and a high exhaust pressure. Therefore, even a moderate change in exhaust pressure, due to process demand, will effect the steam turbine exactly as though the load were changed considerably.

It is also an economical advantage to maintain constant speed of the wet end in the event the paper breaks and the driers or calenders must be clutched in and out. With a steam turbine drive this means maintaining constant speed with change not only in load but also exhaust pressures, because when a break occurs, it is usually necessary to decrease the steam in the dryers. The decreased load and/or decreased exhaust pressure would obviously result in an increased operating speed if the governing device allowed the speed of the unit to be higher at light loads than at full rated load.

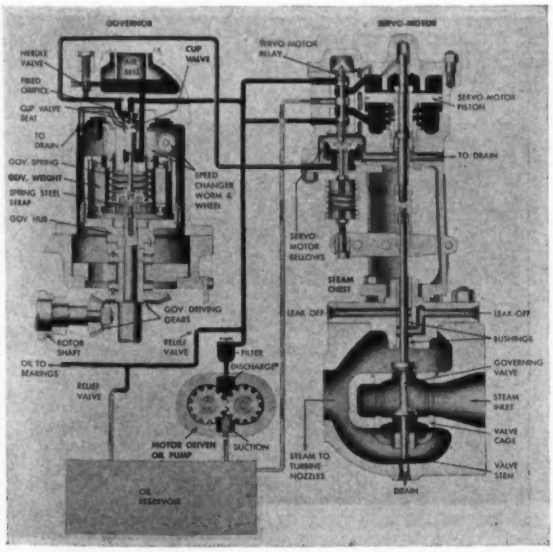


FIG. 1
Diagrammatic Arrangement of Paper Mill Drive Governor Mechanism.

Four Essential Elements

The governor as featured on Westinghouse turbines consists essentially of four elements:

1. A separate motor-driven pump supplying oil for governing and lubrication at constant pressure independent of the turbine speed.
2. A pair of governor weights fastened to a steel spring strap mounted across the governor hub and driven from the turbine rotor shaft. This speed responsive element is frictionless and lightning fast. Because it is inherently frictionless, it accurately reacts to the most minute speed change. The design of the flexible governor strap enables the speed changer to bring the unit to a standstill.
3. A cup valve accurately establishes the proper governing oil pressure by its action as a relief valve which is readjusted by the most minute change in speed.
   It is designed to have no appreciable friction. The clearances around the guides are relatively large, thus eliminating the force which would be required to shear the oil if this clearance were small.
   Also the guide portions of the cup valve have a helical groove that equalizes the pressure around the moving part, thus preventing side thrust.
   Its design effects a scaleless speed element. Because the oil flow by the single control edge of the cup valve is at right angles to the axis, the axial reaction becomes negligible. The cup valve is proportioned to cancel out all scale effects.
4. A serve-motor which positions the steam admission valve in response to governing oil pressure changes. This governing oil pressure is a function only of the position of the steam admission valve when the system is in equilibrium since it merely measures the extension of the follow-up linkage spring
   The needle valve and air bell, or equivalent device for providing time lag, in conjunction with the speed responsive element and cup valve are made to cause the servo-motor to actuate the governor valve to maintain any pre-determined speed regardless of changes in steam conditions or load.
   The important feature that makes this possible is cancellation of the effect of change in governing oil pressure after the steam admission

valve is positioned to carry a new load at the original speed. The interconnection, with delayed action, between the oil chamber just above the cup and the oil chamber below the cup valve body permits the speed of the unit to return to the original speed after a change in steam condition or load has occurred.

Diagrammatic Arrangement

Diagrammatically the governor, servo-motor, and single-valve steam chest are as shown in Fig. 1. High pressure oil (shown in black) is supplied at constant pressure by a motor-driven pump for governor and servo-motor operation. The small portion used in the governor enters the chamber above the cup valve —the zone in which the value of the governing oil pressure (shown in dark gray) is determined— through a fixed orifice (a piston with large radial clearance). The position of the cup valve with reference to its seat determines the flow of oil to drain (shown in light gray) and therefore the governing oil pressure. Since the position of the cup valve is determined by the position of the governor weights, the governing oil pressure is responsive to changes in turbine speed. Should the turbine speed increase, for example, the centrifugal force of the governor weights moves the cup valve upward (against the downward force of the governor spring and the governing oil pressure) decreasing the flow to drain and increasing the governing oil pressure until the new downward force balances the increased centrifugal force of the governor weights. The increased governing pressure thus established is communicated to the governing valve servo-motor bellows. This moves the servo-motor relay upward, admitting high pressure oil above the servo-motor piston and draining oil from below, thereby closing the governing valve as required.

Providing Time Lag

Thus far the action described has been that of a straight centrifugal weight-oil relay governor which has an inherent regulation or speed change between full load and no load. However, reference to the diagram will show that governing oil pressure is also admitted below the cup valve, through a needle valve and air bell—the latter, or its equivalent, for the purpose of providing time lag. This, following the initial governing impulse, counteracts the effect of the change in governor oil pressure on top of the cup valve. This action may be shown more clearly by following the effects of an assumed case of a turbine speed increase. The speed increase causes the cup valve to move nearer its seat, thereby increasing the governing oil pressure which immediately, through the action of the servo-motor, moves the steam admission valve in the closing direction. The closing of the admission valve halts the rise in speed and then starts decreasing the speed. Now while the speed is slowing down toward the original value, the effect of the decreasing centrifugal force is being counteracted by the delayed increasing oil pressure under the cup valve body, thus preventing further overtravel and finally re-establishing complete equilibrium when the steam admission valve reaches the position necessary to carry the new load at the original speed. It is this delayed oil pressure change under the cup valve body that compensates for the inherent tendency of a centrifugal weight governor to operate at higher speeds with decreasing loads. The result is that the speed change between full load and no load is practically zero. The sequence, of course, is reversed with a turbine speed decrease.

In considering this governor it is important to keep in mind the fact that the action is instantaneous because the spring steel strap is displaced but a few thousandths of an inch and the governing oil fluid flow, while positive, is small—being little more than the transmission of a hydraulic impulse.

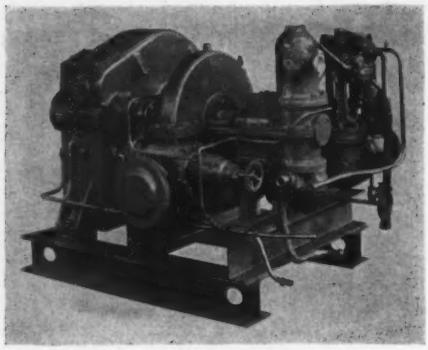


FIG. 3
Type C Turbine and Reduction Gear. Turbine Provided with Paper Mill Type Governor.

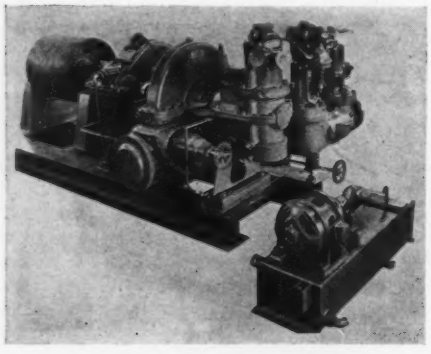


FIG. 2
Type C Turbine Connected Through Reduction Gear to Driving Pulley of Paper Machine. Oil Reservoir and Motor Driven Lubricating Oil Pump in Foreground.

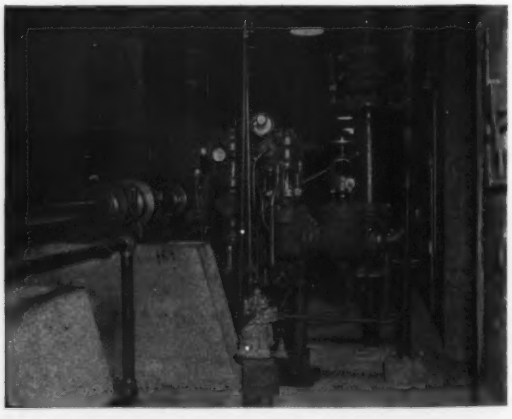


FIG. 4
Type C-25, 350 hp. Turbine Installed in an Eastern Plant of a Large Paper Manufacturing Company. Steam Conditions: 140 lbs. 0 deg. Superheat, 25 lbs. Back Pressure. Governor Provides a Speed Range of 8 to 1.

Motor Operated Speed Changer

The hand or motor-operated speed changer, by means of which the speed can be varied, consists essentially of a worm and wheel which is threaded on the cup valve housing and acts directly on the governor spring. The wheel forms the upper support for the governor spring so that its downward movement increases the governor spring compression and hence increases the turbine speed, while its upward movement has the opposite effect. The worm and wheel can be operated either by a hand wheel or motor.

The turbine is put into operation by starting the motor driven oil pump and opening the steam supply valve. It is shut down by closing the steam supply valve, or in an emergency, remotely stopping the motor driven oil pump—causing the low oil pressure trip mechanism to close the separate overspeed trip valve.

New Brookville Locomotive

A new series of Brookville locomotives, in 4, 5 and 6 tons weight, is now available with the UD-6 International Diesel engine recently introduced by the International Harvester Company. This engine is a four-cylinder, four-stroke cycle, full Diesel, developing 39 hp. at 1500 r.p.m.

As used in the Brookville locomotive, the UD-6 Diesel engine makes an ideal locomotive power plant. Its high torque at slow speeds gives it the lugging ability of a steam engine. Its smooth flow of abundant power is applied efficiently to all four locomotive drive wheels through four forward and four reverse speeds, the latter of which are made available by the Brookville reverse gear operating in conjunction with a heavy duty, four-speed transmission. The work capacity of the locomotive is further increased by the use of steel tires, which increase traction by a full 25 per cent over chilled face drive wheels.

Other features of the Brookville locomotive include: dual spring journal suspension, which permits high speed over poor track; an indestructable steel frame; Timken bearings; and use of standard "International" parts in the engine clutch and transmission, to permit after sales field service by any International Harvester branch. For literature send to the Brookville Locomotive Company, Brookville, Pa.

New Type With International Diesel

Plastic Packing with Reinforced Tape

The Crane Packing Company, 1800 Cuyler avenue, Chicago, Ill., announces a new development in the manufacture of their Super-Seal plastic packing. It is now being made with a patented tape back reinforcement securely vulcanized to the outer surface of the packing. This vulcanized tape reinforcement replaces the old frictional woven cotton jacket and now a non-frictional surface bears directly against the moving part. Due to the tape back reinforcement, this new packing is extremely pliable and can be bent around small diameter rods and shafts without fracturing or cracking, or formed into small I. D. rings without distortion.

Super-Seal is a dry-graphitized plastic packing made from pure long-fibre asbestos, anti-frictional metal particles and special binders. It contains no oils that can be driven off by heat or pressure and the packing flows easily under gland adjustment. This packing is recommended for centrifugal and rotary services such as centrifugal feed pumps, low pressure steam rods, valve stems, centrifugal pumps, rotary pumps, and expansion joints. It is available in six styles for special services:

No. 1—For general service—air, water, steam, mild chemicals, etc., where temperatures do not exceed 550 degrees F. No. 2—For superheated steam, hot oils and hot gases where temperature run higher than 550 degrees F. No. 3—For oils, petroleum distillates, and solvents, with temperatures up to 550 degrees F. No. 4—For foods, fruit juices, and edibles. Non-metallic and contains no graphite. Often used on stainless steel. No. 5—For chemicals, caustic alkalies, and acids. Non-metallic. No. 6—For superheated steam or gases, where temperatures do not exceed 750 deg. F. Non-metallic.

Each of the types is available in sizes from ¼ inch to 1 inch graduated by sixteenths, in coils, standard length spirals or in die-formed rings or sets to stuffing-box dimensions.

Newsprint Shipments Higher

Shipments of newsprint paper from Newfoundland in the first 10 months of 1940 amounted to 312,763 tons. This was more than shipped in all of 1939 or 1938 and compares with returns of 222,615 tons in the first 10 months of 1939, according to The Financial Post of Montreal, Canada.

Trade with the United States has undergone expansion this year. To the end of October shipments total 132,601 tons, against 67,390 tons for the like period in 1939.

On a percentage basis the United States has taken 41.25 per cent of total shipments from Newfoundland to date this year, as against 30.05 per cent last year.

Government Paper Bids and Awards

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., November 27, 1940—R. P. Andrews Paper Company has been awarded the contract for furnishing the Government Printing Office with 36,600 pounds (300,000 sheets) of 50% rag, 28 x 34 white bond paper at 10.16 cents. Marquette Paper Company will furnish 29,600 pounds (308,000 sheets) of 20 x 25, coral red, light gray, dark gray, gold and light blue antique M.F. cover paper at 6.86 cents. Bids for these items were received on November 13.

Mudge Paper Company will furnish 39,100 pounds (100,000 sheets) of 75% rag, 38 x 48 litho finish map paper at 12.98 cents. Same firm will also furnish 36,000 pounds (160,000 sheets) of 50% rag, 32 x 42 double coated book paper at 12.41 cents. Marquette Paper Company will furnish 34,500 pounds (300,000 sheets) of 21 x 32 white sulphite ledger paper at 5.8 cents. Bids for these items were received on November 8.

Paper Corp. of U. S. will furnish 42,000 pounds (1,500,000 sheets) of 50% rag, 10½ x 16 white M.F. litho paper at 10.24 cents. Stanford Paper Company will furnish 64,000 pounds (500,000 sheets) of 34 x 44 25% rag, white bond paper at 9.6 cents. Same firm will also furnish 7,800 pounds of 26 x 28, 50% rag, white bond paper at 68,800 pounds if same 21 x 32 at 10.35 cents. Bids for these items were received on November 6.

Mudge Paper Company will furnish 96,500 pounds (1,500,000 sheets) of 25% rag, various size white bond paper at 9.73 cents. Also Barton, Duer & Koch Paper Company will furnish 37,500 pounds of 50% rag, 21 x 32 white manifold paper at 16.19 cents. R. P. Andrews Paper Company will furnish 8,000 sheets of 15 x 21, No. 56 Crane's artificial parchment paper at $48.31 per M sheets. Bids for these items were received on November 4.

R. P. Andrews Paper Company will furnish 10,000 sheets of 100% rag, azure note paper 14 x 8⅞ at $27.10 per M sheets, bids for which were received on November 1.

Andrews Paper Company will also furnish 504 pounds of 100% rag, 22 x 34 white bond paper at $29.40 per M sheets, bids for which were received on October 30.

Same firm will also furnish 2,100 sheets of 21 x 24 white sensitized paper at $46.50 per M sheets, bids for which were received on October 18.

The Printing Office has received the following bids for 36,600 pounds (300,000 sheets) of 50% rag, 28 x 34 white bond paper; R. P. Andrews Paper Company, 10.16 cents; Barton, Duer & Koch Paper Company, 11.50 cents; Stanford Paper Company, 10.38 cents; Aetna Paper Company, 10.68 cents; Graham Paper Company, 10.55 cents; Paper Corp. of U. S., 11.65 cents; Whitaker Paper Company, 10.45 cents; Mudge Paper Company, 10.94 cents; Old Dominion Paper Company, 14.435 cents; Walker Goulard Plehn Company, 14.05 cents; and Cauthorne Paper Company, 10.97 cents.

For 141,000 pounds of 32 x 42 M.F. book paper; Whitaker Paper Company, 5.36 cents; Mudge Paper Company, 5.09 cents; R. P. Andrews Paper Company, 5.09 cents; Barton, Duer & Koch Paper Company, 5.32 cents; Stanford Paper Company, 5.09 cents; Frank Parsons Paper Company, 5.12 cents; Paper Corp. of U. S., 5.4 cents; Marquette Paper Company, 5.18 cents; Cauthorne Paper Company, 5.03 cents; and Walker Goulard Plehn Company, 5.39 cents.

For 29,600 pounds (308,000 sheets) of 20 x 25, coral red, light gray, dark gray, gold and blue antique M.F. cover paper; Marquette Paper Company, 6.88 cents; Paper Corp. of U. S., 6.88 cents; Whitaker Paper Company, 7.59 cents; Mudge Paper Company, 7.22 cents; R. P. Andrews Paper Company, 7.21 cents; Barton, Duer & Koch Paper Company, 7.80 cents; Stanford Paper Company, 7.25 cents; Old Dominion Paper Company, 7.5824 cents; Cauthorne Paper Company, 7.33 cents; and Eastern Corp., 9.38 cents and 1.251 cents.

For 16,000 pounds (100,000 sheets) of 75% rag, 36 x 52 litho finish map paper; Mudge Paper Company, 13.88 cents; Whitaker Paper Company, 15.76 cents; R. P. Andrews Paper Company, 14.93 cents; Barton, Duer & Koch Paper Company, 12.90 cents; Stanford Paper Company, 15.77 cents; Old Dominion Paper Company, 19.63 cents; and Paper Corp. of U. S., 14.65 cents.

For 35,900 pounds (1,000,000 sheets) of 50% rag, various sized manifold paper in blue, yellow; Stanford Paper Company, 15.93 cents; Marquette Paper Company, 13.47 cents; Barton, Duer & Koch Paper Company, 13.47 cents; Mudge Paper Company, 13.52 cents; Paper Corp. of U. S., 14.75 cents; and R. P. Andrews Paper Company, 16.1 cents.

For 15,000 pounds of 50% rag, 31 x 38 white bond paper; R. P. Andrews Paper Company, 10.87 cents; Barton, Duer & Koch Paper Company, 10.95 cents; Stanford Paper Company, 15.50 cents; Aetna Paper Company, 10.63 cents; Mudge Paper Company, 10.48 cents; Paper Corp. of U. S., 11.65 cents; Old Dominion Paper Company, 13.47 cents; Cauthorne Paper Company, 11.26 cents; and Walker Gould Plehn Company, 13.19 cents.

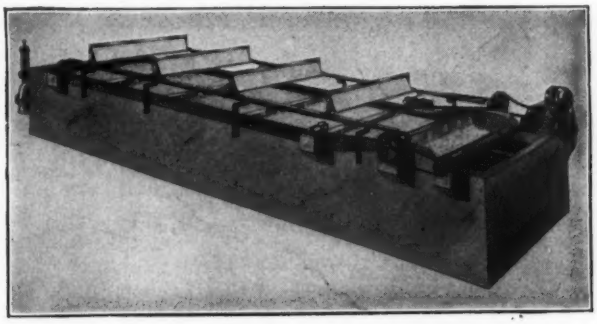
For 63,500 pounds of 24 x 38 50% rag, white bond paper; R. P. Andrews Paper Company, 12.97 cents; Barton, Duer & Koch Paper Company, 12.92 cents; Stanford Paper Company, 15.50 cents; Aetna Paper Company, 10.63 cents; Mudge Paper Company, 13.38 cents; Paper Corp. of U. S., 11.65 cents; Old Dominion Paper Company, 13.47 cents; Cauthorne Paper Company, 12.98 cents; and Walker, Goulard Plehn Company, 18 cents.

New Pile Driver Hose by Manhattan

A new hose said to be especially constructed to withstand the strenuous conditions encountered on steam pile drivers is being marketed by the Manhattan Rubber Mfg. Division, Passaic, New Jersey, as Condor Pile Driver Steam Hose.

According to the manufacturer, Condor Pile Driver Steam Hose has a special tube of strong rubber compounded to resist the deteriorating effects of heat and oil. Heat insulation is provided by the use of one ply of braided asbestos cord, and five to seven plies of close-woven extra heavy duck, depending upon the size, give the hose necessary strength for this service. The black rubber cover is heat and abrasion resisting.

HEAT?
FIBER?
FILLER?
WATER?



Which of these is the source of YOUR greatest loss?

A SVEEN PEDERSON FLOTATION UNIT can assist you in obtaining the maximum recovery of all four.

Ask some of the present users of this system — or better still — see a unit in operation.

BULKLEY DUNTON PULP COMPANY, INC.

295 Madison Ave., New York, N. Y.

CONSTRUCTION NEWS

Kansas City, Mo.—The Graham Paper Company, 332 West Sixth street, commercial paper products, has arranged for lease of building to be erected by the North Kansas City Development Company, Railway Exchange Building, at Fourteenth and Clay streets, North Kansas City, designed particularly for company occupancy. New structure will be one-story, totaling about 40,000 square feet of floor space, and is estimated to cost over $50,000, with equipment. The Graham company will expand operations at new location, where extensive storage and distributing facilities will be provided. Erection contract has been awarded to Hiram Elliott Construction Company, 912 Baltimore avenue, Kansas City, and work will be placed under way at once. Keene & Simpson, Land Bank Building, Kansas City, are architects.

Dover, N. J.—The Seeley Tube and Box Company, 360 Thomas street, Newark, N. J., manufacturer of paper boxes and containers, paper cans, cores, etc., has concluded arrangements for purchase of portion of former plant of the Richardson & Boynton Company, manufacturer of furnaces, at Dover, totaling about 125,000 square feet of floor space, plus a tract of available land, and will occupy the property at once for new plant. It will replace a plant of the company at Fernwood, Pa., destroyed by fire several weeks ago, and similar to operations at that plant, will be given over to the production of containers for the Government, for which company has a large contract. Alterations and improvements will be made at once, with installation of machinery and equipment. It is expected to have new plant ready for operations at early date, with employment of over 200 workers.

Hamilton, Ohio—The Beckett Paper Company, manufacturer of bond and other writing paper stocks, has begun erection of new addition to mill, recently referred to in these columns, and is awarding a number of sub-contracts for various work. An award for electrical work has been let to the Wente Electric Company, Hamilton; and for installation of a sprinkler system to the Viking Company, Cincinnati, Ohio. New structure will be one-story and will be used for storage and distribution. It is estimated to cost approximately $45,000, with equipment. The F. K. Vaughn Building Company, First National Bank Building, Hamilton, has the general erection contract.

Oklahoma City, Okla.—The Carpenter Paper Company, 27-29 East Grand avenue, commercial and other paper products, has completed plans for new storage and distributing plant at 918 Olie drive, consisting of a one-story and basement building, 140 x 248 feet, to provide large increase in present facilities. It is estimated to cost close to $100,000, with equipment. General contract for erection has been let to Ellis, Nicholson & Cramer, Hightower Building, Oklahoma City, and excavations are being placed under way. Sorey, Hill & Sorey, First National Bank Building, Oklahoma City, are architects.

Minneapolis, Minn.—The Fleur City Paper Box Company, 504-6 Plymouth avenue, North, manufacturer of folding paper boxes and containers, has begun superstructure for new addition to plant, to be used for increased capacity in storage and distributing department, and expects to have the structure ready for occupancy around the close of the year. It is reported to cost about $25,000, with equipment. Leander & Johnson, 1830 Chicago avenue, Minneapolis, have the general contract for erection.

Kansas City, Mo.—The H. H. Smith Paper Company, 1011 McGee street, wrapping and other commercial paper products, is arranging for early removal to building at 1028 Broadway, where increased storage and distributing facilities will be provided.

Green Bay, Wis.—The Wisconsin Public Service Corporation, Milwaukee, is arranging an appropriation of about $4,478,000 for expansion and improvements in properties in 1941, more than one-half of which will be expended at Green Bay and vicinity, for increased power supply for paper mills and other industrial plants served by the company. Approximately $2,640,000 will be used for expansion in Bayside steam-electric generating plant at Green Bay, on which work was begun recently, and over $500,000 for new transmission lines leading from this plant to different points of company system.

Menasha, Wis.—The U. S. Paper Supply Company, 59 East Van Buren street, Chicago, Ill., waste paper goods, has work in progress on two additions to branch storage and distributing plant on Appleton street, Menasha, previously referred to in these columns, and will push construction to early completion. Structures will be one and two-story, respectively, 48 x 80 feet, and 40 x 80 feet, in order noted, reported to cost about $40,000, with equipment, and will be occupied by the Menasha Mill Supply Company, an associated interest. General contract is being carried out by Fred Piette & Son, 1108 North Oneida street, Appleton, Wis.

St. Jean, Que.—The Kraft Paper Products, Ltd., 83 Richelieu street, manufacturer of kraft paper goods, has completed plans for one-story addition to plant, reported to cost over $50,000, with equipment. General erection contract has been let to J. P. Trahan, 178 Mercier street, St. Jean, and work is scheduled to begin at once.

Kingston, Ont.—Canadian Industries, Ltd., Montreal, Que., has concluded arrangements for purchase of tract of about 100 acres of land fronting on Lake Ontario, Kingston, and will use as a site for new Nylon synthetic fiber mill, for which plans will be prepared at once. It will comprise a group of one-story buildings, to be equipped for an initial capacity of about 400,000 pounds per annum, with chemical laboratory, power house, machine shop and other mechanical structures. Plant is scheduled for completion in the fall of 1941, and is estimated to cost close to $1,500,000, with machinery.

New Companies

Philadelphia, Pa.—The American Paper Specialty Company, Eleventh street and Ridge avenue, has filed notice of organization to deal in paper products of various kinds, with headquarters at ad-

Clays for Coating and Filling

English China Clays Sales Corporation

551 FIFTH AVENUE, NEW YORK

November 28, 1940

dress noted. New company is headed by Joseph E. Colen, Conshohocken, Pa., and Willard F. Nice, Philadelphia.

New York, N. Y.—Derrico-Canastota, Inc., has been organized with capital of $25,000, to deal in waste paper stocks. New company is represented by Boccia & Contiguglia, 132 Nassau street, New York, attorneys.

Brooklyn, N. Y.—The Federal Label Company, Inc., has been chartered with capital of 200 shares of stock, no par value, to manufacture paper labels of various kinds and kindred paper goods. New company is represented by Behr & Shagan, 51 Chambers street, New York, N. Y., attorneys.

Long Island City, New York—The Rag Processing Corporation has been incorporated with capital of 200 shares of stock, no par value, to deal in waste paper products. New company is represented by Max Hofmann, 1475 Broadway, New York, N. Y., attorney.

SEC Exempts Nekoosa-Edwards Co.

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., Nov. 27, 1940 — Federal Securities & Exchange Commission has ruled that the Nekoosa-Edwards Paper Company is exempted from all of the provisions of the Public Utility Holding Company Act of 1935 which requires it to register under the Act because of its directly or indirectly owning, controlling or holding with power to vote 10% or more of the outstanding voting securities of the Nekoosa-Edwards Light and Power Company.

In connection with this order the Commission has the following to say: "Nekoosa-Edwards Paper Company has applied, pursuant to Section 3 (a) (3) of the Public Utility Holding Company Act of 1935, for exemption from the provisions of said Act for itself as a holding company and for Nekoosa-Edwards Light and Power Company as its subsidiary. After appropriate notice a hearing was held.

"The applicant is a Wisconsin corporation engaged in the manufacture and sale of paper and paper products. Its plants for the manufacture of such products are located at or near Port Edwards and Nekoosa, Wisconsin. Its property, plant and equipment account is recorded on its balance sheet as of December 31, 1939, at the net figure of $5,490,306. This includes the carrying value of four hydro-electric plants having an aggregate installed capacity of approximately 9,250 kw and two steam electric plants with an aggregate installed capacity of approximately 6,000 kw which are used to supply applicant's manufacturing requirements. During the year, 1939, applicant generated 72,664,660 kwh, of which 1,889,348 kwh were sold to its subsidiary, Nekoosa-Edwards Light and Power Company, for distribution in the communities in which applicant's manufacturing plants are located.

"Applicant owns all the outstanding securities, consisting of common stock, of Nekoosa-Edwards Light and Power Company, also a Wisconsin corporation. This company is a public utility company engaged in the distribution of electric energy at retail in the communities of Port Edwards and Nekoosa, Wisconsin. The entire requirements for electric energy of this company are supplied by applicant. The total assets of Nekoosa-Edwards Light and Power Company are recorded on its books at $178,702. Applicant records its investment in this company at $45,000.

"It is apparent from this comparison of applicant's fixed capital investment in its principal business, and the investment of its wholly owned subsidiary in utility assets, that applicant is primarily engaged in a business other than that of a public utility company. In view of the character of applicant's manufacturing business and the use of electric energy in such business, we find that the retail distribution of part of the electric energy generated by applicant by a wholly owned subsidiary company in the communities in which applicant's manufacturing plants are located is incidental to applicant's business.

"Since applicant owns all the outstanding securities of its public utility subsidiary, it is unnecessary for us to consider whether or not applicant derives any material part of its income from such subsidiary, the situation in that respect being covered by clause (B) of Section 3 (a) (3).

"The order of the Commission will exempt the applicant from all provisions of the Act that would require its registration thereunder because of its control over its subsidiary public utility company, Nekoosa-Edwards Light and Power Company.

"By the Commission, Commissioner Henderson not participating."

Brown Co. Office at Berlin

As of December 2, 1940, the main office of the Brown Company will be located at Berlin, N. H., home of the company's pulp and paper mills according to an announcement made by the trustees of Brown Company. This action coincides with the closing of the company's offices at Portland, Maine.

H. P. Carruth, general manager, will be at Berlin, as will all departments of the company except the sales department. The General Sales offices are at 500 Fifth avenue, New York.

Hawley To Retire Bonds

Notice is being given that the Hawley Pulp and Paper Company will retire remaining first mortgage sinking fund 6s at the call price of 102½. Call is effective as of January 1, 1941. Funds have been deposited with Bank of California for immediate redemption which also includes interest coupons which were due July 1, 1933, and January 1, 1934. These had been deferred at reorganization in 1934 until maturity of issue July 1, 1946. Latest statement of company showed $649,000 principal amount of issue remaining.

Correction

Norman H. Rhodes, formerly New England representative of the Waterfalls Paper Mills, with headquarters in Boston, has not formed a connection as salesman with the Seymour Paper Company of New York, as was reported in the November 21 issue of THE PAPER TRADE JOURNAL.

Lawrence Killam Returns

[FROM OUR REGULAR CORRESPONDENT]

Lawrence Killam, president B. C. Pulp and Paper Company with plants at Port Alice and Woodfibre, B. C., has returned to the head office of the company at Vancouver after spending some time at Montreal conferring with other pulp and paper executives.

FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for Week Ending November 28, 1940

	High	Low	Last
A. P. W.	....	....	....
Armstrong Cork Co.	32¼	31	31½
Celotex Corp.	7¾	7	7
Celotex Corp., pf.	66½	63	66
Certain-Teed Products Corp.	5½	4¾	4¾
Certain-Teed Products Corp., pf.	38½	34⅝	35½
Champion Paper & Fibre Co.	22½	22⅜	22⅜
Champion Paper & Fibre Co., pf.	105	104¼	104½
Congoleum-Nairn Co.	18¾	18¼	18½
Container Corp. of America	16	15¼	15¼
Continental-Diamond Fibre Co.	7¾	7¼	7¼
Crown-Zellerbach Co.	16½	15¼	15¼
Crown-Zellerbach Co., pf.	91½	90	91
Flintkote Co.	16⅞	15¾	15¾
Robert Gair	2⅞	2⅝	2⅝
Robert Gair, pf.	16	15⅝	16
International Paper & Power	17¾	15⅞	16⅛
International Paper & Power, pf.	70¾	66¾	66¾
Johns-Manville Corp.	64½	60¾	62
Johns-Manville Corp., pf.	126¼	124	125
Kimberly Clark Corp.	38¼	37½	38⅛
MacAndrews & Forbes	31	30¼	30½
MacAndrews & Forbes, pf.	....	....	....
Masonite Corp.	29	26½	26½
Mead Corp.	10⅛	9¼	9⅜
Mead Corp., pf.	....	....	....
Paraffine Companies, Inc.	38	37⅜	38
Paraffine Companies, Inc., pf.	99¾	99¾	99¾
Rayonier, Inc.	17⅞	16¾	16¾
Rayonier, Inc., pf.	28¼	26¼	27⅞
Ruberoid Co.	17⅛	16½	16⅝
Scott Paper Co.	38⅛	37	37
Scott Paper Co., pf.	112	112	112
Sutherland Paper Co.	23¾	23½	23½
Union Bag & Paper Corp.	13⅜	12⅝	12⅝
United Paperboard Co.	3¾	3¾	3¾
U. S. Gypsum Co.	70	68	68¾
U. S. Gypsum Co., pf.	176	173	173

New York Curb Exchange

High, Low and Last for the Week Ending November 28, 1940

	High	Low	Last
American Box Board Co.	4¾	4¾	4¾
Brown Co., pf.	20	18	18
Great Northern Paper	43	43	43
Hummel-Ross Fibre Corp.	6¼	6½	6½
National Container Corp.	11¾	11⅛	11⅛
St. Regis Paper Co.	2¾	2⅝	2⅝
St. Regis Paper Co., pf.	81½	75½	79½
Taggart Corp.	4⅛	4	4

No Equity for Abitibi Junior Claims

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., November 25, 1940 — Notwithstanding the fact that the greatest asset in connection with the Abitibi Power and Paper Company is the timber concessions held by the company, by the grace of the Ontario government, H. J. Symington, chairman of the Bondholders' Protective Committee, declared last week in his testimony before the Royal Commission investigating the affairs of the company in an effort to find some means of getting it out of receivership, that the Bondholders' Protective Committee would have to take the stand that any legislation by Ontario to implement a re-organization plan for Abitibi, would be ultra vires. Mr. Symington stated further that the deposit agreement with the bondholders gives the committee the right to change its plan where such changes are considered to be in the interests of the depositors of the bonds, and that there is no equity and never had been for the junior security holders.

By way of amplification of these statements Mr. Symington told the commission during its last session before a two-weeks' adjournment, how his committee arrived at the bid of $30 millions offered at the time of the judiciary sale. They took the market value of the Abitibi certificates of deposit, as of the day before the sale, struck off the odd dollars, added them up and there it was—thirty millions of dollars. He stressed the statement that the bondholders would never bid up to the $74 millions of their claims, or $83 millions if United States funds are added.

With reference to the right of the committee to change its plans, Mr. Symington explained that instead of issuing all common stocks, if the committee should buy the properties, it could sell Abitibi to a new company as proposed for some bonds and some stocks—perhaps 50% of each to be given as a unit. By this unit provision, there would be no necessity to change the warrants which shareholders and creditors would get. The warrant would merely give the right to purchase these units instead of shares alone.

"There has been no equity; there can be no equity; there is not a chance of bondholders recovering the money owing to them," he said.

Abitibi Earns $702,459

Earnings of the Abitibi Power and Paper Company Limited for the month of October, 1940, prior to audit and charges for depreciation of $148,750, and bond interest of $286,585 (includes interest on overdue interest) amounted to $702,459, as compared with $731,764 for the month of September, 1940, and $544,827 for the month of October, 1939.

Shipments of newsprint in October, 1940, amounted to 37,210 tons, as compared with 36,697 tons in September, 1940, and 37,246 tons in October, 1939. Present indications are that shipments of newsprint in November, 1940, will be about 35,000 tons, as compared with 38,668 tons in November, 1939.

Shipments of sulphite pulp in October, 1940, amounted to 5,152 tons, as compared with 6,268 tons in September, 1940, and 5,193 tons in October, 1939. Present indications are that shipments of sulphite pulp in November, 1940, will amount to about 6,000 tons, as compared with 5,195 tons in November, 1939.

Included in the above mentioned earnings for September, 1940, is $131,392 received as premium on United States exchange. Bond interest of $286,585 for such month is exclusive of the premium which would have to be paid to permit payment of such interest to be made in the United States, as can be required.

Sharp Increase in Dividend Payments

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., November 25, 1940—General improvement in the pulp and paper industry has found reflection in dividend disbursements. A compilation made by the statistical department of the Montreal Stock Exchange and Curb Market indicates that dividend payments on pulp and paper stocks listed here showed a sharp increase in the first ten months of this year in comparison with the corresponding period of 1939. The total was $5,668,394 as compared with only $966,197 in the 1939 period. It is explained, however, that the 1940 total includes $8,486,342 paid in dividends on the preferred stock of International Paper & Power Company. This

would leave a balance of $2,182,052 paid by other companies in the group, which is an improvement of $1,215,855, or over 100 per cent.

Schumacher Earns $1.25 Share

The Schumacher Wall Board Corporation for the six months ended October 31, reports a net income of $118,428, equal, after preferred dividends, to $1.25 each on 66,000 common shares, compared with $90,-681, or 94 cents a common share, for six months ended October 31, 1939. Quarter ended October 31: net income, $73,656, or 78 cents a common share, against $44,772, or 46 cents a share, in preceding quarter and $51,090, or 54 cents a share, in October quarter last year.

So. Advance Bag Stock at $10.75

The Southern Advance Bag and Paper Co., Inc., has filed an amendment reporting that the public offering price of its 79,992 shares of common stock would be $10.75 a share.

The amendment also revealed that underwriters for the stock are E. H. Rollins & Sons, Inc., Coffin & Burr, Inc., Shroeder, Rockefeller & Co., Inc., Shoellkopf, Hutton & Pomeroy, Inc., and Johnson, Lane, Space & Co., Inc.

Continental-Diamond Nets $331,556

The Continental-Diamond Fiber Company and domestic subsidiaries for the nine months ended September 30, reports a net profit of $331,556, compared with $49,496 net profit last year; sales less returns and allowances, $4,259,865, against $4,068,089. September quarter: Net profit, $84,086, against $22,-607 in same quarter of 1939; net sales, $1,408,157, against $1,356,334.

Kimberly-Clark Votes Dividend

NEENAH, Wis., November 25, 1940—The Kimberly-Clark Corporation has declared a dividend of 50 cents per share on common stock, payable December 26 to stockholders of record December 10. This is in addition to the regular quarterly dividend payment of 25 cents due January 2 to holders of record December 10.

Parker-Young Earns $90,489

The Parker-Young Company for the year to August 31 reports a net income of $90,489, equal after preferred dividends to $5.18 a share on 11,740 shares of common stock, compared with $8,299 earned in preceding fiscal year; total sales, $3,430,756, compared with $2,759,133.

Carpenter Nets $1.74

The Carpenter Paper Company for the nine months to September 30, reports a net income, according to figures filed with SEC, of $182,161, equal, after preferred dividends, to $1.74 each on 93,369 shares of $10 par common stock; net sales, $7,895,085.

Gaylord Container Pays 55 Cents

A dividend of 55 cents a share has been voted on the common stock of the Gaylord Container Corporation, making a total of $1 for the stockholders this year. Disbursements for 1939 were 70 cents a share.

Rayonier Earnings Up

Consolidated net profit of Rayonier, Inc., and its wholly owned subsidiary, the Georgia Timber Company, amounted to $2,139,109 for the six months ended on October 31, first half of its current fiscal year, according to the report of Edward M. Mills, president, issued for publication today. Charges against the profit include interest, depreciation, depletion, Federal income and excess profits taxes.

After allowing for regular preferred dividend requirements, the result is equivalent to $1.57 a share on 963,871 shares of common stock. It compares with a consolidated net profit of $870,152, or 25 cents a common share, reported for the first half of the year.

Before providing for Federal income and excess profits taxes, the profit for the first half of the current fiscal year was $4,063,202, against $1,041,849 for the six months to October 31, 1939.

For the three months ended with October, the company showed a consolidated net profit of $1,053,-557 after taxes and other charges, or 77 cents a share on the common stock. For the preceding quarter the net profit, revised to give effect to increased Federal income taxes and to estimated excess profits taxes applicable to that period, totaled $1,085,552, or 80 cents a common share. For the quarter ended on October 31, 1939, the net was $652,236, or 35 cents a share, on the common.

The company cleared up all dividend accruals on its preferred stock in the six months ended with October, with payments of $2,191,717, or $3.50 a share. The regular quarterly of 50 cents a share has been declared payable on January 2, 1941. In addition to the preferred dividend accruals, the company prepaid $1,000,000 of its long-term notes in the six-month period, representing the semi-annual installments of $500,000 each due on August 1, 1941, and February 1, 1942. These prepayments left $5,500,000 of the long-term loans outstanding as of October 31.

Pairpoint Sells Box Business

Sale of the equipment and machinery of the paper box department of the Pairpoint Corporation, to E. M. Jasse of 30 West 25th street, New York, was announced on November 21 by Seabury Stanton, president of Pairpoint, according to a press dispatch in the New Bedford *Mercury*.

Mr. Stanton said the paper box division was a small part of the Pairpoint business which did not seem to fit in with the corporation's other activities, and it was deemed best to discontinue its operation. He intimated, however, that the purchaser plans to continue operation of the equipment in New Bedford or vicinity after its removal from the Pairpoint plant about January 1.

Mr. Jasse, who formerly was president of the J. and J. Corrugated Box Company of Fall River and once was connected with the Champion Paper Company, said yesterday he plans to move the Pairpoint box-making machinery to a new location, possibly in New Bedford or Fairhaven, and to add considerably to it for the purpose of establishing a paper box factory, which will be operated under the direction of E. N. Erickson, manager of the box department at Pairpoint.

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Our Sincere good wishes and congratulations to the

CHAMPION PAPER & FIBRE COMPANY

upon the completion of their recent addition at

Houston, Texas

✦ ✦ ✦

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Impco Flat Screens—bronze vats—Dunbar Drives Impco Knotters — Impco Black Liquor Vacuum Washer — Thorne Bleaching Equipment — Impco Bleach Plant Vacuum Washers —

IMPROVED PAPER MACHINERY CORPORATION

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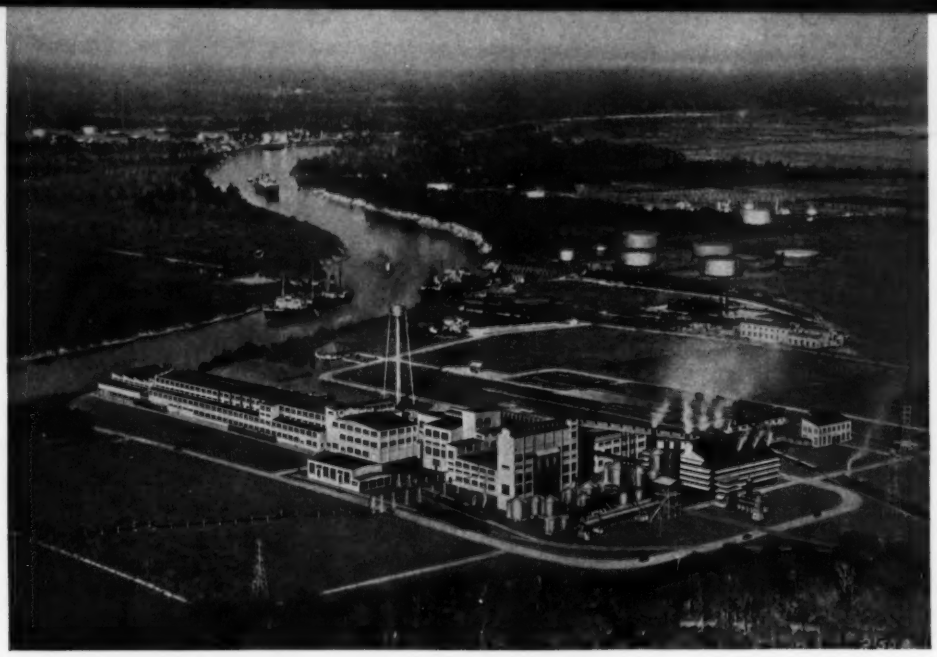


Champion Installs New Paper Making Unit At Its Plant at Houston, Texas

By H. T. Baker, Paper Mill Engineer, H. K. Ferguson Co.

The new fine paper mill of the Champion Paper and Fibre Company at Houston, Texas, was conceived and constructed to meet a growing demand on the part of magazine publishers for a coated paper which will give better printing results and which also can be produced at reasonable cost. The new Champion plant, which was placed in operation early in July, is looked upon as a model in paper mill design and efficiency. It is a modern, flexible mill wherein all grades of paper can be produced, from machine-finished medium-grade stock, to coated, super-calendered, high grade papers. Machine coated papers are its specialty.

One of the Fastest Paper Machines

It is equipped with one of the longest and fastest paper making machines in existence, capable of producing 1500 feet of paper a minute, and at a trim width of 190 inches, or practically 16 feet. Paper making in this plant is a continuous process from the time the wood arrives at the pulp plant until it comes out of the mill as a finished product. Construction of the mill was first specifically envisioned when the publishers of *Time* and *Life* magazines started looking for a source of supply for a higher grade magazine paper.

Champion's mill at Houston already was engaged in the production of white strong bleached pulp from Southern pine. This pulp had shown itself to be particularly suited to the manufacture of this type of paper. As a consequence it was only natural that officials of *Time* and *Life* should turn to Champion for their paper, and that Champion should make this paper at Houston. However, new facilities and equipment had to be provided.

H. K. Ferguson Constructs Plant

The engineering work and supervision of construction, for the complete new mill, was done by the H. K. Ferguson Company, of Cleveland, Ohio, while the Merritt-Chapman & Scott Corporation was awarded the contract for construction of the buildings to house the new equipment.

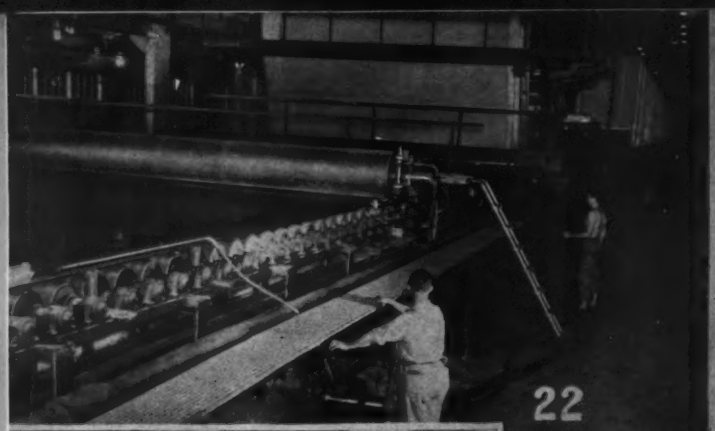
Specifications for the paper machine equipment were drawn up by the Champion Paper and Fibre Company. The specifications for the other equipment required were drawn up by Ferguson engineers in consultation with the Champion Company.

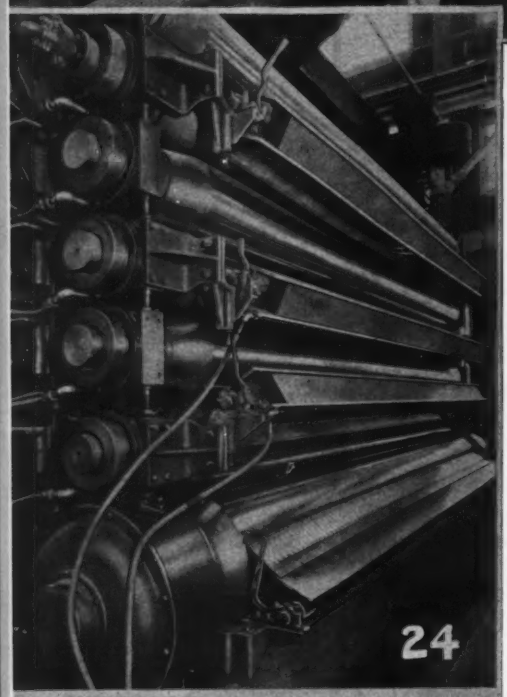
The specifications for the machinery were the result of test runs and experiments made by Champion to determine just what was required in the way of such equipment for the manufacture of a machine coated paper. Champion's research department collaborated to get the proper relation of driers and coaters, drier temperatures, unit pressure, and crowns of rolls. Also worked into the plans and schedules were the ideas of pulp preparation developed and derived from Champion's years of paper making.

Reinforced Concrete Construction

As to the buildings themselves, the machine room is of reinforced concrete construction. The roof over this building is of structural steel construction, with wood deck. The beater room is of structural steel construction, with concrete floors. The storage building is of flat slab construction on the lower floors, structural steel, and concrete slabs on the upper floors.

The entire building construction was designed for the carrying of heavy loads, and the complete absence of settlement or vibration. The foundation was set in yellow clay, which meant that it required widespread footings because of the fairly low allowable load permitted by the clay.





INSTALLATIONS IN MILL OF CHAMPION PAPER AND FIBRE COMPANY

HOUSTON, TEXAS

22. Wet End of Machine.

23. 214 Inch BELOIT Fourdrinier for Machine Coating of Papers. This Machine is Capable of Producing 1500 Feet of Machine Coated Paper Per Minute, at a Trim Width of 190 Inches.

24. This Calender Stack in the New Houston Mill is Completely Equipped with VICKERY Hi-Flex Doctors to Permit Continuous Instead of Intermittent Doctoring of Every Roll, Both Steel and Fiber.

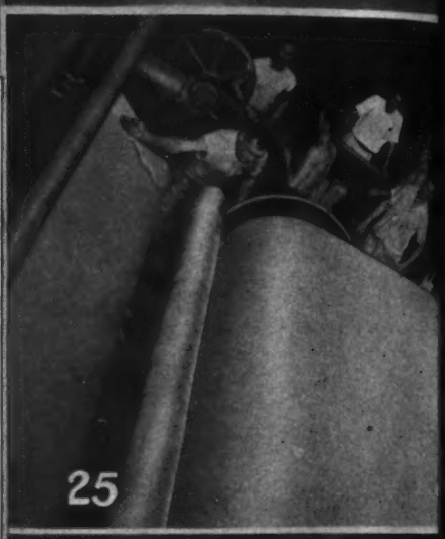
25. Taking the Tail of the Couch.

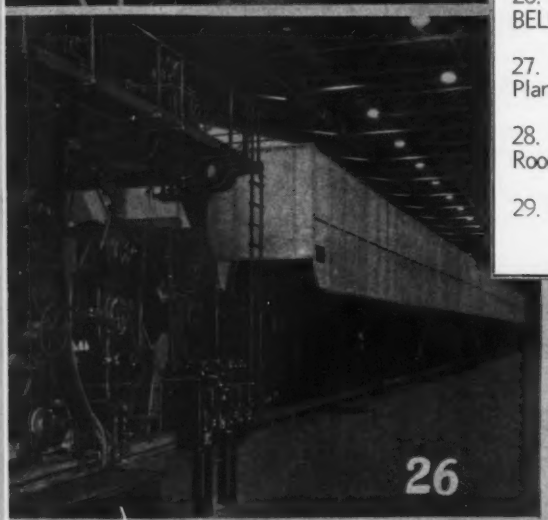
26. Another view of the 214 inch BELOIT Fourdrinier.

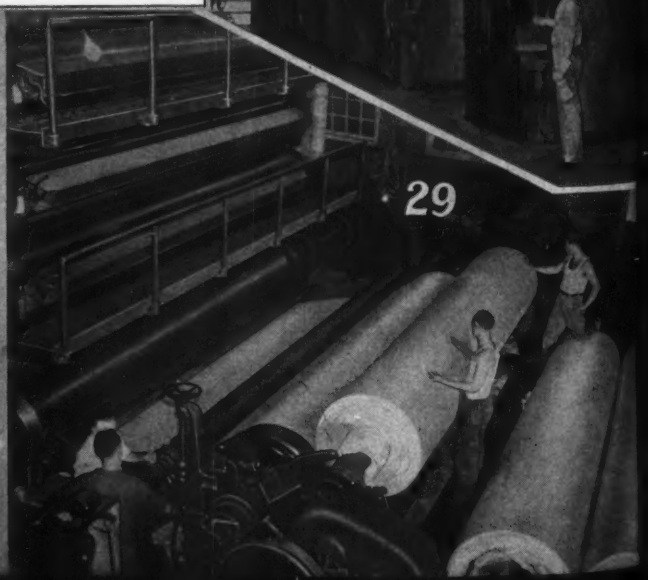
27. Digesters at the Houston Pulp Plant.

28. Exterior View of the Machine Room of the New Mill.

29. Reel End of Paper Machine.







Some idea of the problems posed in the engineering of the buildings may be had from the fact that eighteen to nineteen hundred tons of machinery is included in the one paper machine, which is designed to produce a mile of stock in less than four minutes. Only the stablest of foundations will support such a load.

Make Two Kinds of Pulp

Until the demand for the new paper arose, Champion had been producing and bleaching only one kind of pulp in the Houston mill. It was now necessary that two kinds of pulp be made simultaneously. Consequently, the digesters had to be separated, the two kinds of wood to be cooked had to be separated by partitions in the chip bins, washers after the digesters had to be separated, separate screen systems had to be supplied, and a complete new additional bleaching plant added, together with the required storage.

With this additional bleaching system, furnishes of slush pulp were possible without feeding the beaters with part dry sheets for the furnish.

The additional bleaching plant was designed along the same lines as Champion's previous plant. It uses the continuous multistage system, with vertical tile lined reaction towers discharging into agitated chests below, the stock being washed and thickened between stages by vacuum filter washers.

IMPCO Equipment Installed

The Improved Paper Machinery Corporation of Nashua, N. H., furnished the bleach towers, agitator and discharge mechanisms, as well as the vacuum filter washers and mixers.

The bleached stock is stored in slush form in Kalamazoo Tile Tanks, from where it is pumped to the beater room. In the beater room the slush stock of two grades comes first to a Trimbey metering box, where the proportions of the two stocks can be set, as well as the total quantity varied to suit specific needs.

The metered stock then goes over a thickener where its consistency is brought up to six per cent, which is desired for beating. The thickener also acts as a save-all to reclaim the fiber from the excess white water from the paper machine. This thickener save-all was furnished by Improved Paper Machinery Corporation.

The thickened stock is conveyed by spiral stainless conveyors, furnished by the Jeffrey Manufacturing Company, to measuring tanks located over the beaters. These are tile lined and are equipped with a quick opening discharge valve.

Vickery Felt Conditioners are used in connection with every press felt in the mill in order to safeguard against the heavy expense and production losses that would result from midweek machine shutdowns for washing up clogged, dirty felts. Vickery Conditioners keep the felts continuously clean and open right through the week, resulting in better and more uniform paper finish and assuring maximum water removal at the presses.

Vickery Hi-Flex Doctors are installed on every roll, both steel and fibre, on the machine calender stacks at Champion. This is in line with best modern practice since Vickery Doctored calender rolls may be continuously rather than intermittently doctored so that the roll surfaces are always clean and shining and the usual heavy loss from calender marks and scabs is prevented.

The large super-calender stack at Champion is also completely equipped with Vickery Hi-Flex Doctors in order to assure maximum production and low roll maintenance expense.

Six Dilts Beaters

The six beaters are of the Dilts hollow midfeather fast circulating type, with 66-inch diameter by 60-inch face bandless steel filled rolls. The tub is cast iron, with a concrete bottom, tile lined. Roll lightering is done by motor, with push button control at an operator's panel. All beaters are equipped with Taylor continuous beater roll load indicators and recorders.

The five Jordans which process the stock after the beaters, are E. D. Jones Majestics. These are equipped with 350 hp, 450 rpm, synchronous motors. A pre-hydrating Jones Majestic Jordan, equipped with Bidwell lining, was installed ahead of the beaters to hydrate either stock before beating.

All stock chests are concrete, tile lined, and are agitated by adjustable pitch propellers set in midfeather. A separate dump chest is provided to receive the beater dump, flushing and thoroughly mixing this before transfering it to the beater chest. The agitator equipment was furnished to Champion by the Hill Clutch Company.

"Color Coating" Equipment

The "color coating" equipment is housed in the beater room. This equipment conforms to Champion standards for ball mills, cooking, mixing, blending and screening of finished coatings. Storage for two kinds of clay is provided in concrete bins, equipped with the necessary conveyors. Storage space for other coating ingredients also is provided.

The paper machine is combined with the supercalendar building, making a room 550 feet long from wall to wall. This is served by two electrically operated Harnischfeger cranes. One is a 40-ton, two trolley crane, the other a 15-ton single trolley device.

The 214 inch Fourdrinier machine was furnished to Champion by the Beloit Iron Works. It was built according to Beloit standards, but to specifications supplied by Champion. This machine has a 100 foot wire, a four roll dual press, a total of 70 driers divided into six sections of driers, two nine roll calandar stacks on open side frames, and a uniform speed reel arranged for center winding.

General Electric Sectional Drive

A General Electric sectional drive was used for this machine. It is of the latest type, having both automatic and manual adjustments. This makes the drive exceptionally versatile.

Power is supplied through a synchronous motor generator set, requiring 2200 volts, three phase, 60 cycle A. C. There are 15 sectional drive motors without taking into consideration the 18 felt drier helper motors.

Five No. 3-A Bird Screens are used to screen the stock after it has passed through Vortraps for cleaning. This screened stock is pumped to a high slice of 120 inches maximum to feed the machine.

The five big Bird Dual Drive Screens of the latest advanced design handle the entire mill production. These screens have the capacity to permit fine cut

BEL

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THE BELOIT WAY

BELOIT IRON WORKS

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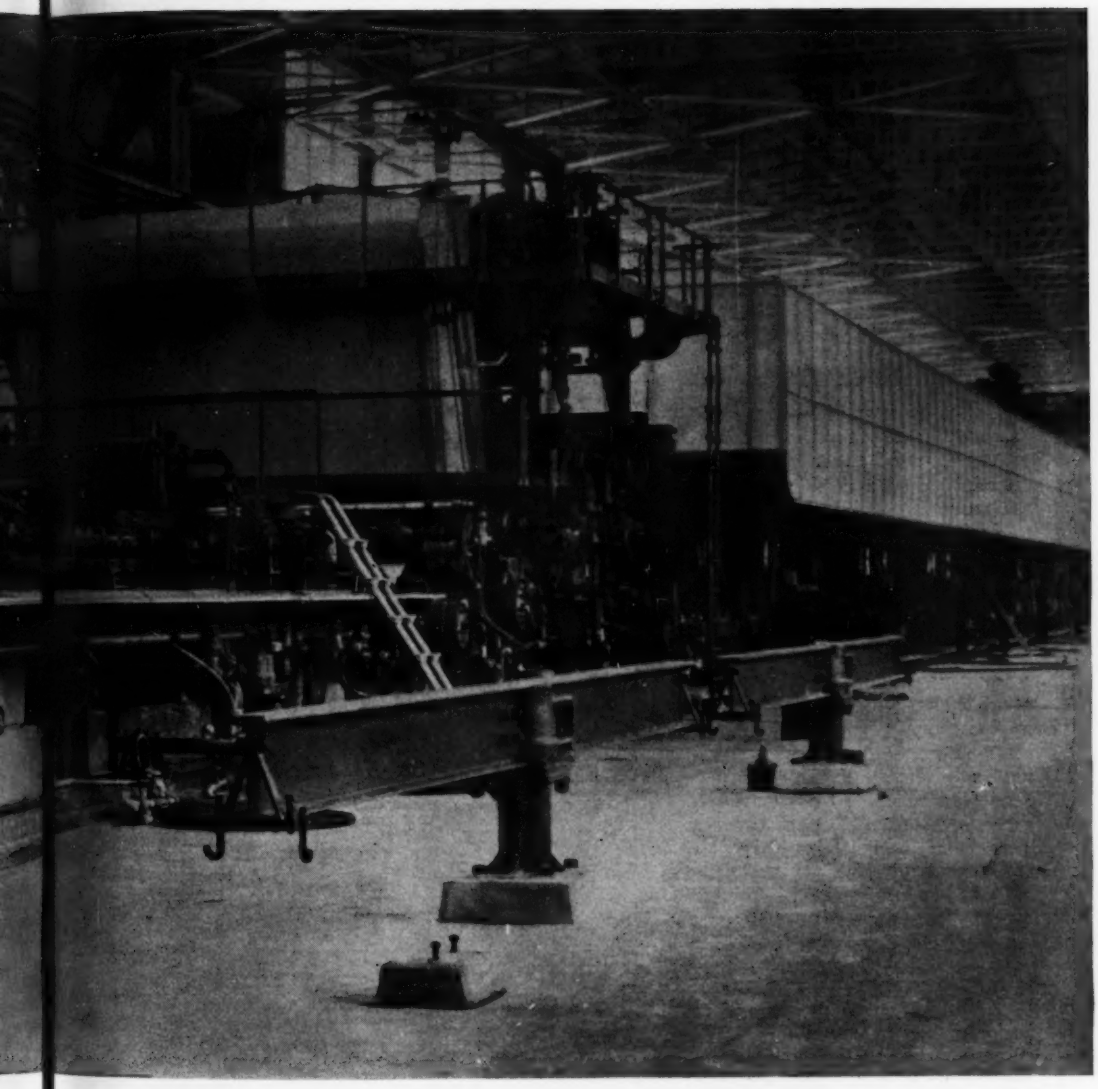


BUILDER OF THIS 214" HIGH
AMPION PAPER AND FIBRE CO.

IS THE MODERN WAY

BELOIT, WISCONSIN

screen plates and at the same time provide the gentle, efficient screening action that is essential for maximum dirt removal.

Ventilating System by Ross

The ventilating system, consisting of a supply system of fan and duct work, a Ross asbestos hood over the driers, and exhaust fans discharging from hood to outside, was supplied by the J. O. Ross Engineering Corporation. A special feature of the supply system is duct work at the driers, designed to supply cool air for summer ventilation.

In addition to this, the Ross firm also supplied the duct work for furnishing the sectional drive motors with cooling air, as well as for the electrical control room housing the sectional drive, motor generator set, and switchboards.

The two drum winder for the new Champion mill was supplied by Beloit. With it they supplied their roll stripping device which pulls the rolls off the core shaft, breaks the rolls apart in case of interweaving, and lowers the rolls to the floor through a hydraulically operated lowering device. After this operation the rolls are wrapped and shipped or delivered to the super-calendar department.

Largest Super-Calender in U. S.

The super-calenders for the new plant were specially designed by Champion. These represent what is believed to be the largest set of super-calendars in the United States. It consists of a double open side frame with calendars mounted back-to-back. These calendar rolls are 194 inch face.

It was not possible for any one firm to furnish these calendars, consequently the necessary parts were supplied by various firms, as follows:

Frames, Black-Clawson Company; rolls, Midvale Steel Company; bearings, S.K.F. Industries, Inc.; unwinders and winders, Beloit Iron Works; drive, General Electric Company; reduction gears, the Falk Corporation; elevators for access, Barrett-Cravens Company; roll cooling refrigeration, Kelvinator Company.

The super-calendars will take a jumbo roll 57 inches in diameter and the full width of the machine, and super-calendar it at a speed of up to 1500 feet a minute. In the same operation it is wound on a two drum winder, and after having been slit to the required widths of rolls. The control panel for this unit is placed in a location convenient to the super-calendar. All operations are controlled from this point by the operator.

For super-calendaring small rolls, the Champion Paper and Fibre Company has provided an 80-inch super-calendar which was transferred from its plant in Canton, N. C. A rewinder for rewinding rolls after super-calendaring also is provided.

The Finishing Room

A finishing room equipped with cutters and layboys and trimmers, sorting tables, wrapping tables and the like, has been provided beyond the supercalandar building. This is located on the top floor of the storage building. Most of the equipment for this finishing operation was transferred from various other Champion plants.

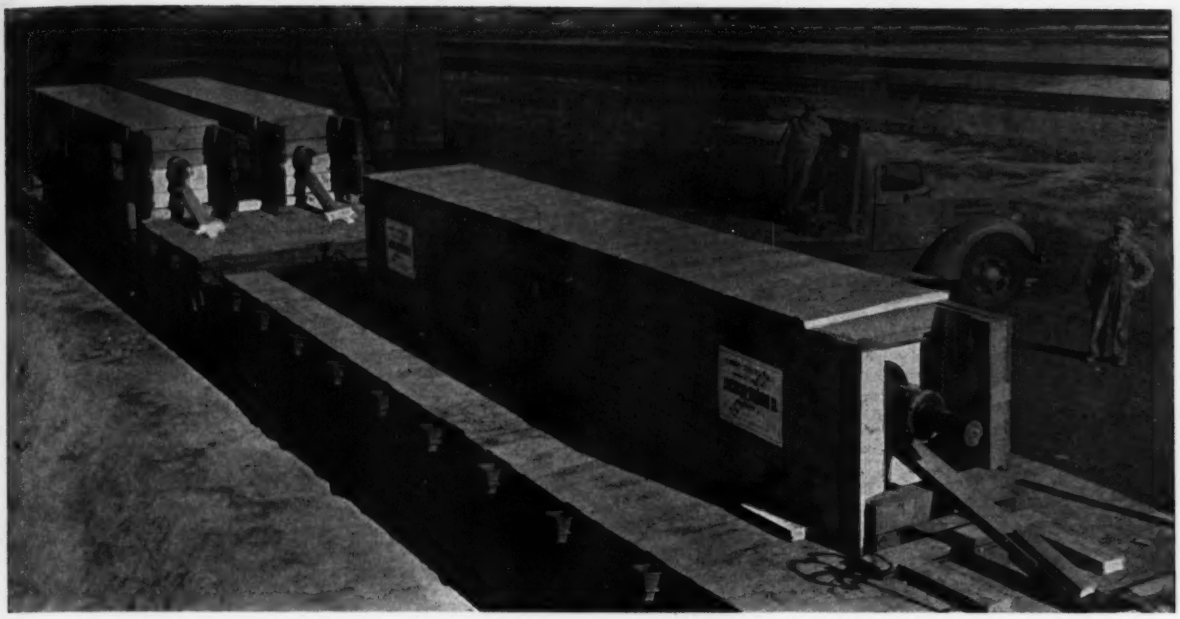
In the finishing room and beater building, self-leveling Otis elevators are used in the handling of raw materials and finished product.

Champion's contract with the publishers of *Time* and *Life* takes care of about 60 per cent of the mill's production. The balance of this production will be marketed to the paper trade, with a heavy percentage going to Southwestern users.

Location of the Houston plant makes it possible to ship the paper by rail, for which purpose loading tracks have been provided on each side of the finishing room, or the finished product can be shipped by water and barge via the Inland Waterways to points as far north as Chicago. W. R. Crute is manager of the Houston plant.

Sub-Contractors and Manufacturers of the Principal Equipment

Agitators and Drives	Hill Clutch Machine Foundry Co.
Ammeters	Westinghouse Electric & Mfg. Co.
Agitators for Clay Cooking	Dedman Foundry & Machine Co.
Alumina Kit	National Aluminum Corp.
Beaters and Control (6-2500 lbs.)	Dilts Machine Co.
Broke Beater Cap (2,000 lbs.)	Noble & Wood Machine Co.
Beater Drives	Texas Belting & Supply Co.
Beater Belts	Peden Iron & Steel Co.
Ball Mills	Dodge Mfg. Corp.
Bleach Plant Equipment	Improved Paper Machinery Corp.
Bearing Housings and Frames for Super Calenders	Black-Clawson Co.
Bearings for Super Calender	SKF Industries, Inc.
Couplings	Falk—Branch Krachy Co.
Calenders (80" Supercalender)	Black-Clawson Company
Calender Cooling System	J. O. Ross Engineering Corp.
Conveyors Stock and Clay	Jeffrey Mfg. Co.
Copper Piping	R. A. Burroughs
Cranes (1-40 ton 1-15 ton)	Harnischferger Corp.
Condensate System	Midwest Fulton Machine Co.
Control Automatic for Beaters	Taylor Instruments
Cocks (Plug)	DeZurik Shower Co.
Chloramine Treatment	Wallace & Tiernan, Inc.
Color Scale	Exact Weight Scale Co.
Classifier	The Bauer Bros. Co.
Drain Covers	Alamo Iron Works
Doors (wood)	Southern Planing Mills Co.
Doors (overhead)	J. G. Wilson Corp.
Drier Temperature Control	Foxboro Co.
Digester (3400 Cu. ft.)	Combustion Engineering Corp.
Digester Temperature Control	Foxboro Company
Direct Current Control	Westinghouse Electric & Mfg. Co.
Doctors	Bird Machine Co.
Electric Sectional Machine Drive	General Electric Co.
Electric Drive Super Calenders	General Electric Co.
Elevators	Otis Elevator Co.
Exhausters	J. O. Ross Engineering Corp.
Evaporators	Swenson Evaporator Co.
Elevators (portable)	Barrett-Cravens Co.
Felt Conditioners	Bird Machine Co.
Fire Protection Valves	A. P. Smith Mfg. Co.
Fire Protection Pipe and Fittings	U. S. Pipe & Foundry Co.
Fly Rolls, Bogs and Brackets for Super Calenders	Black-Clawson Co.
Guards	Houston Blow Pipe & Sheet Metal Works
Heating and Ventilating	J. O. Ross Engineering Corp.
Heat Box and Slice (size 120" head for 1500 mach. speed)	Valley Iron Works
Hoods	J. O. Ross Engineering Corp.
Heater (liquor)	Fibre Making Processes, Inc.
Hoists	Peden Iron & Steel Co.
Large Vapor Piping	Wayatt Metal & Boiler Works
Lighting Transformers	Westinghouse Electric & Mfg. Co.
Levelator	Rotary Lift Company
Liquid Level Recorders	Brown Instrument Co.
Motors and Control (aux.)	Westinghouse Electric & Mfg. Co.
Machine Screens (5-No. 3A)	Bird Machine Co.
Monorails	American Monorail Co.
Niagara Screens	The W. S. Tyler Co.
Overhead Cranes	Harnischferger Corporation
Overhead Sliding Doors	J. G. Wilson Corp.
Paint	Sherwin-Williams Co.
Push Button Control Stations	Cutler-Hammer, Inc.
Pumps (vacuum)	Nash Engineering Co.
Pumps (water and stock)	Ingersoll Rand Company
Pumps (chemicals)	Goulds Pump, Inc.
Pumps (digester)	Fibre Making Processes, Inc.
Pumps (for evaporators)	LaBour Co., Inc.
Pumps (stock)	Economy Pump, Inc.
Pipe (steel)	Jones & Laughlin Steel Corp.
Pipe (rubber lined)	U. S. Rubber Co.
Pipe (wood lined)	Michigan Pipe Co.
Pipe (copper)	R. A. Burroughs & Co.
Pipe Supports	National Valve & Mfg. Co.
Pulleys	Texas Belting & Supply Co.
Plug Cocks	DeZurik Shower Co.
Productimeters	Durant Mfg. Co.
Roll Press	The Apoleton Machine Co.
Roll for Super-Calenders	Farrel Birmingham Co.
Roll Shafts	Appleton Machine Co.
Rolls for Super-Calender (steel)	The Midvale Co.
Inclosures (Wire Mesh)	Berger Ornamental Iron & Wire Works
Jordans and Filling (6 Majestic)	E. D. Jones & Sons Co.
Layboy and Overlapping Delivery	Maxson Automatic Machine Co.
Rotometers (bleach)	Schutte Keorrting
Roll Grinder	Farrel Birmingham Co.
Rewinder (type 14)	Cameron Machine Co.



TENSILASTICS heading south

TENSILASTICS are running in
HOLLINGSWORTH & WHITNEY COMPANY
MOBILE MILL

TENSILASTICS are running in
CHAMPION PAPER & FIBRE CO. MILL
AT PASADENA, TEXAS

and many other southern mills

You will find Tensilastics in every section of this and other countries, wherever there are paper mills, proving that freight rates caused by great distances are not obstacles where Tensilastics are concerned, for Tensilastics run longer; consequently, they cost less.

Install Tensilastics in your machines and make them prove that they are low cost rolls.

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T-94

REG. U. S. PATENT OFFICE

Reduction Gears	The Falk Corp.
Screens (centrifugal)	Bird Machine Co.
Screens (flat)	The Improved Paper Machinery Co.
Screens (clay)	The W. S. Tyler Co.
Scales	Toledo Scales Co.
Switchgear (power house 440 v.)	Westinghouse Electric & Mfg. Co.
Switchgear (drive) 220 v.	General Electric Co.
Sprinklers	Grinnel Co.
Super-Calender (80" width)	The Black-Clawson Co.
Stock Chests (Tile)	Kalamazoo Tank & Silo Co.
Suction Box Planer	Eastwood-Nealley Corp.
Steam Flow Meters	Bailey Meter Co.
Trimmers	Harris-Seybold-Potter Co.
Temperature Control (Digesters)	The Foxboro Co.
Trucks (Clay and Casein and Lift)	Lewis Shephard Sales Co.
Valves	Wm. Powell Co.
Valves (float)	Mason-Neilan Regulator Co.
Valves (Stock)	Record Foundry & Machine Co.
Vortraps (20 in all)	Nichols Engineering & Research Corp.
Voltmeter Recording	General Electric Co.
Washers (Vacuum)	Improved Paper Machinery Co.
Wood Lined Pipe	Michigan Pipe Co.
Paper Machine	Beloit Iron Works
68-5' Dryers, 2-8' Dryers four Machine Coaters	Beloit Iron Works
2-9 Roll Open Side Machine Cal. Stacks Dual Reel	Beloit Iron Works
Paper Machine and Supercalender Drives	General Electric Co.

"IMPCO" Installations

The major portions of the mechanical equipment for the pulp mill end of the new addition at Houston were furnished by the Improved Paper Machinery Corporation, Nashua, N. H.

A new "IMPCO" Vacuum Washer for washing black liquor from the pulp as it comes from the digesters is now being installed. This machine is equipped with a nickel iron valve and rotating seat for resistance to corrosion, and the "IMPCO" Driven Forming Roll which gives a preliminary extraction of liquor before washing from the washing showers starts.

Pulp for the new system goes through its own blow tank, is washed, and stored in the washed stock chest. From this, it is pumped to the "IMPCO" bronze vat flat screens which are of the silent type using the Dunbar (patented) drive.

Following these, the stock is thickened and goes to the multi-stage continuous bleachery. Each stage in the bleaching is followed by a vacuum washer furnished by "IMPCO", as was the bleachery mechanical equipment for mixing of pulp and chemicals entering the high density towers, for discharge from the towers, and for agitation in the dump chests following the towers.

The bleached stock is then riffled and rewashed over an "IMPCO" 8x12 double valve vacuum machine from which it goes to the bleached stock storage chest for this grade.

From the chest, it can be sent either to the pulp drying machine, or pumped as slush to the combined "IMPCO" thickener and Saveall located above the beater room which delivers the stock to measuring tanks above the beaters.

Limits Newspapers to a Single Sheet

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., November 27, 1940—Shortage of all kinds of paper consumed in Algeria is becoming evident, according to a report from the American Consulate General, Algeria. Newspapers are reduced to a single sheet. Most periodicals have ceased to appear, posters are prohibited, and stores may not wrap up purchases except when absolutely necessary.

Algeria is almost entirely dependent upon imports since only a small quantity of wrapping paper is produced in the country.

To Replace Wooden Cutter Sticks

Although the matter of cutting sticks is very often considered an unimportant item, the average finishing room foreman has never been satisfied with the regular wooden stick because of the irregularity of its surfaces and the tendency of the stick to warp, swell, jam, split, "shimmy" and dust under the strain to which it is subjected. Considerable time is usually wasted by the cutter man in building up the uneven surfaces which are characteristic of the wooden stick and because of its lack of uniformity the bottom sheets of paper trimmed, as a general rule show rugged edges.

A new device has recently been developed which has been tried and proven and has already been placed in a number of representative mills with very satisfactory results.

This equipment consists of a solid aluminum piece known as the Green Foundation which fits very snugly the full length of the slot in the cutter table and may remain in the slot permanently. This foundation is guaranteed for a year and should last a life time. Along the outside of the foundation are strong steel springs spaced about eight to ten inches apart, which take up any possible slack between the foundation and the sides of the table slot. The top of the foundation is grooved, and strong steel springs are spaced also about eight to ten inches apart along one side of the groove, which hold securely a lastick insert which is the same length as the foundation. In the groove, near one end of the foundation slot is a strong steel pin which meshes with a hole in either end of the lastick and prevents it from "creeping". The knife blade does not contact this pin but has ample clearance.

In one end of the foundation is a square slot into which a tool, which is provided with the equipment, can readily be inserted for quickly removing or reversing the lastick. The entire equipment comes flush with the top of the cutter table and permits of smooth and rapid operation in the handling of paper and board.

The lastick is a tough strip of composition which possesses the proper construction to afford a perfect, firm cushion to the knife blade as it comes to rest and it is possible to trim a pile of paper through to the bottom sheet without ragged edges. The lastick is reversible and gives long service.

The particular advantages claimed for this new device are the accuracy with which it fits the slot in the cutter table, the perfect cushioning which it provides for the knife blade, the ease of operation, time saved in removing or reversing the lastick, cleanliness in operation, accurate, clean cutting, and elimination of the undesirable features characteristic of the wooden stick referred to in the first paragraph.

This equipment is relatively inexpensive, is available in practically all standard lengths, and can be produced in almost any length. At the present time it is furnished for the three-quarter inch table slot but will be available in other sizes shortly. One Green foundation, two dozen lasticks and a tool for removal of the lasticks are packed to a carton.

It is offered on ten days' trial and is being distributed by C. P. Robinson, 420 Lexington avenue, New York City.

Plant of THE CHAMPION PAPER AND FIBRE COMPANY at Pasadena, Texas

MERRITT-CHAPMAN & SCOTT CORPORATION

COMPLETES ITS SEVENTH
MAJOR PULP AND PAPER MILL CONTRACT IN THE SOUTH
IN THE LAST FIVE YEARS

The completion of an important addition to this modern plant of The Champion Paper and Fibre Company for the manufacture of high grade Coated Paper adds another notable achievement to the comprehensive list of new Southern mills recently built by MERRITT-CHAPMAN & SCOTT CORPORATION which are now producing Kraft Pulp, Paper and Board, Coated Papers and Newsprint.

The experienced and efficient organization that constructed these plants in record time is available to fulfill your plans for expansion.

ENGINEERING CONSTRUCTION DIVISION

MERRITT-CHAPMAN & SCOTT CORPORATION

17 BATTERY PLACE FOUNDED 1860 NEW YORK, N.Y.

Open Paper Bids for Six Months' Supply For Government Printing Office

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., November 27, 1940—Thirty-nine bidders submitted bids on Monday to the Joint Congressional Committee on Printing for paper for six months for the use of the Government Printing Office beginning January 1 next. There were several representatives who had never bid before on the semi annual supply. Also in some cases prices were lower than for the six months period at the opening last May. The Committee announced that it will meet on December 2 to consider awards. The bids received Monday were as follows:

Newsprint

No. 1—2,000,000 lbs., 24x36—64; rolls, 19, 24, 36, and 48 ins. wide (3-inch fiber cores, weight of cores and wrappers shall be included in net weight).

Old Dominion Paper Company	3.4327c
National Pulp & Paper Co. (350,000 lbs. only)	2.75c
Paper Corp. of U. S.	3.20c

Machine-Finish Book

No. 3—500,000 lbs., 25x38—70; flat, cut 24x32, 28x38, and 31¼x45½ ins.

Whitaker Paper Co.	5.49c
Mudge Paper Co.	5.34c
R. P. Andrews Paper Co.	5.38c
Stanford Paper Co.	5.49c
Marquette Paper Co.	5.172c
Barton, Duer & Koch Paper Co.	5.41c

No. 4—700,000 lbs., 25x38—70; flat, cut 24x38, 38x48 and 38x50 ins.

Whitaker Paper Co.	5.44c
John F. Post, Inc.	6.20c
Mudge Paper Co.	5.28c
R. P. Andrews Paper Co.	5.28c
Stanford Paper Co.	5.43c
Frank Parsons Paper Co.	5.172c
Barton, Duer & Koch Paper Co.	5.46c

No. 5—700,000 lbs., 25x38—70; flat, cut 24x38, 38x48 and 38x50 ins.

Whitaker Paper Co.	5.39c
John F. Post, Inc.	6.20c
Mudge Paper Co.	5.24c
R. P. Andrews Paper Co.	5.23c
Stanford Paper Co.	5.63c
Marquette Paper Co.	5.172c
Barton, Duer & Koch Paper Co.	5.49c

No. 6—700,000 lbs., 25x38—70; rolls, 18, 21, and 28½ ins. wide (3-inch fiber cores).

Whitaker Paper Co.	4.80c
Old Dominion Paper Co.	5.4943c
Perkins-Goodwin Co.	4.81c
Graham Paper Co.	6.00c
Mudge Paper Co.	4.795c
R. P. Andrews Paper Co.	4.87c
Stanford Paper Co.	5.39c
Frank Parsons Paper Co.	4.664c
Barton, Duer & Koch Paper Co.	5.19c
Paper Corp. of U. S.	4.93c

No. 7—800,000 lbs., 25x38—70; rolls, 19 and 38 ins. wide (3-inch fiber cores).

Whitaker Paper Co.	4.74c
Old Dominion Paper Co.	5.4943c
Perkins-Goodwin Co.	4.67c
Graham Paper Co.	6.00c
Mudge Paper Co.	4.795c
R. P. Andrews Paper Co.	4.87c
Stanford Paper Co.	5.39c
Marquette Paper Co.	4.664c
Barton, Duer & Koch Paper Co.	5.19c
Paper Corp. of U. S.	4.93c

No. 8—800,000 lbs., 25x38—70; rolls 19 and 38 ins. wide (3-inch fiber cores).

Whitaker Paper Co.	4.74c
Old Dominion Paper Co.	5.4943c
Perkins-Goodwin Co.	4.67c
Graham Paper Co.	6.00c
Mudge Paper Co.	4.74c
R. P. Andrews Paper Co.	4.87c
Stanford Paper Co.	5.31c
Frank Parsons Paper Co.	4.664c
Barton, Duer & Koch Paper Co.	5.19c
Paper Corp. of U. S.	4.93c

No. 9—600,000 lbs., 25x38—70; rolls, 24, 36, and 48 ins. wide (3-inch fiber cores).

Whitaker Paper Co.	4.89c
Old Dominion Paper Co.	5.4943c
Perkins-Goodwin Co.	4.81c
Graham Paper Co.	6.00c
Mudge Paper Co.	4.72c
R. P. Andrews Paper Co.	4.87c
Stanford Paper Co.	5.27c
Marquette Paper Co.	4.664c
Barton, Duer & Koch Paper Co.	5.19c
Paper Corp. of U. S.	4.93c

No. 10—50,000 lbs., 25x38—80; rolls, 32 ins. wide (3-inch fiber cores).

Whitaker Paper Co.	5.98c
Graham Paper Co.	6.00c
Mudge Paper Co.	5.39c
R. P. Andrews Paper Co.	5.30c
Paper Corp. of U. S.	5.33c

No. 11—700,000 lbs., 25x38—80; flat, cut 24x38, 33¼x64, 38x48 and 38x50 ins.

Whitaker Paper Co.	5.22c
Old Dominion Paper Co.	5.8904c
Mudge Paper Co.	5.26c
R. P. Andrews Paper Co.	5.22c
Stanford Paper Co.	5.18c
Frank Parsons Paper Co.	5.023c
Barton, Duer & Koch Paper Co.	5.41c
Paper Corp. of U. S.	5.28c

No. 12—450,000 lbs., 25x38—100; flat, cut 22¼x32¼, 24x38, 24¼x36¼, 31½x48, 32x42, 38x48 and 41x52 ins.

Whitaker Paper Co.	4.92c
Old Dominion Paper Co.	5.2864c
Mudge Paper Co.	4.73c
R. P. Andrews Paper Co.	4.94c
Stanford Paper Co.	4.97c
Marquette Paper Co.	4.852c
Barton, Duer & Koch Paper Co.	5.15c
Paper Corp. of U. S.	5.06c

No. 13—10,000 lbs., 25x38—120 and 140; flat, cut 29x41, 32x52, and 38x48 ins. Min. order 5,000 lbs.

R. P. Andrews Paper Co.	5.51c
Stanford Paper Co.	5.94c

No. 14—30,000 lbs., blue and salmon, 25x38—70 and 100; flat, cut 25x38 and 38x48 ins. Min. order, one color, 5,000 lbs.

Old Dominion Paper Co.	(100 lbs.)	12.49c
Stanford Paper Co.	(70 lbs.)	13.50c
	(100 lbs)	13.50c

Machine-Finish Book End Paper

No. 15—60,000 lbs., for waste leaves; flat, cut 25x38—160; the grain to run the 38-inch way. Min. order 10,000 lbs.

Whitaker Paper Co.	6.29c
Geo. W. Millar Co.	6.80c
Virginia Paper Co.	6.34c
Old Dominion Paper Co.	6.49c
Walker-Goulard-Plehn Co.	6.20c
Thomas Barrett & Sons	6.20c
Perkins-Goodwin Co.	6.662c
Graham Paper Co.	6.76c
Mudge Paper Co.	6.34c
R. P. Andrews Paper Co.	6.19c
Cauthorne Paper Co., Inc.	6.97c
Bulkley-Dunton & Co.	6.20c
L. Hyman & Sons	6.80c
Stanford Paper Co.	6.45c
Marquette Paper Co.	6.20c
Barton, Duer & Koch Paper Co.	6.30c
Paper Corp. of U. S.	6.04c
Butler Corp. of U. S.	6.04c
Butler Co.	6.20c

Offset Book

No. 16—600,000 lbs., 25x38—120; flat, cut 24x38, 25x38, 26x32, 28x40, and 38x48 ins.; grain as ordered.

Whitaker Paper Co.	5.38c
Virginia Paper Co.	6.22c
Old Dominion Paper Co.	6.2838c
Walker-Goulard-Plehn Co.	5.95c
Thomas Barrett & Sons	5.95c
Mudge Paper Co.	5.71c
R. P. Andrews Paper Co.	5.35c
Bulkley-Dunton & Co.	5.95c
Stanford Paper Co.	6.08c
Marquette Paper Co.	5.95c
Frank Parsons Paper Co.	5.69c
Barton, Duer & Koch Paper Co.	5.69c
Aetna Paper Co.	6.594c
Paper Corp of U. S. (1st 3 months)	5.54c
(2nd 3 months)	5.62c
Butler Co.	5.95c

Antique Book

No. 17—600,000 lbs., 25x38—100 and 120 flat, cut 33x43, 38x48 and 38x50 ins.

Whitaker Paper Co.	5.19c
Old Dominion Paper Co.	5.43c
Walker-Goulard-Plehn Co.	5.26c
Thomas Barrett & Son	5.26c
Perkins-Goodwin Co.	4.76c
R. P. Andrews Paper Co.	4.73c
Bulkley-Dunton & Co.	5.26c
Stanford Paper Co.	4.79c
Marquette Paper Co.	4.875c
Barton, Duer & Koch Paper Co.	5.90c
Paper Corp. of U. S.	5.19c
Butler Co.	5.26c

Lightweight Machine-Finish Book

No. 18—50,000 lbs., 25x38—60; flat, cut 32x48 and 38x48 ins.

Walker-Goulard-Plehn Co.	6.75c
Thomas Barrett & Sons	6.75c
Mudge Paper Co.	6.72c
Bulkley-Dunton & Co.	6.75c
Stanford Paper Co.	6.79c
Marquette Paper Co.	6.75c
Paper Corp. of U. S.	6.72c
Butler Co.	6.75c

50 Per Cent Rag Lightweight Machine-Finish Book

No. 19—40,000 lbs., 25x38—60; flat, cut 32x48 and 38x48 ins. Min. order 10,000 lbs.

Old Dominion Paper Co.	13.98c
Paper Corp. of U. S.	13.65c

50 Per Cent Rag Antique Book

No. 20—100,000 lbs., 25x38—80; flat, cut 32x48 and 38x48 ins.

Whitaker Paper Co.	9.96c
Old Dominion Paper Co.	9.97c
Cauthorne Paper Co. Inc.	10.97c
Aetna Paper Co.	10.484c
Paper Corp. of U. S.	10.19c

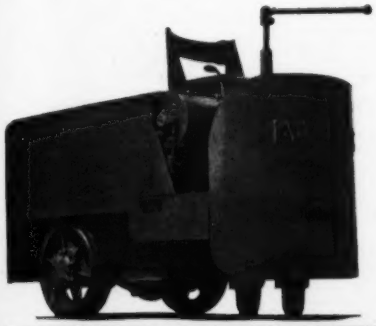
No. 21—30,000 lbs., 25x38—80; flat, cut 22¾x31½, 29x41 and 31½x45½ ins.

Whitaker Paper Co.	9.96c
Old Dominion Paper Co.	9.97c
Mudge Paper Co.	11.84c
Cauthorne Paper Co., Inc.	10.97c
Aetna Paper Co.	10.484c
Paper Corp. of U. S.	10.19c

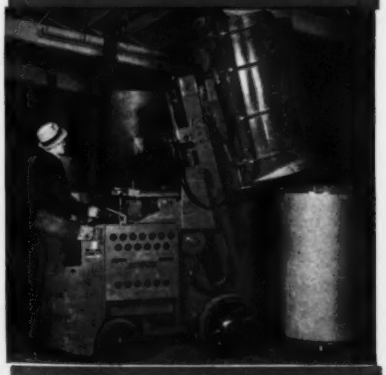
No. 22—100,000 lbs., 25x38—90; flat,

Prepare for NATIONAL DEFENSE PRODUCTION WITH ADEQUATE AND EFFICIENT MATERIALS HANDLING EQUIPMENT

TRADE **AUTOMATIC** MARK



Trailer-Tractor transportation systems close the gap between widely separated buildings or yard storage.



promote economy and efficiency for storing, dispatching and car-loading of flat materials.

3. Motorized Revolving Roll Handling Trucks. Capacites up to 4,000 lbs.

4. Center-Control 3,000 to 6,000 lb. capacity motorized revolving handlers, for paper rolls.

5. Box-cars can be unloaded in record time and rolls placed in storage two high with "AUTOMATIC" Roll-Handlers.

6. 6,000 lb. capacity Low-Lift truck for skid transportation of small rolls.

"AUTOMATIC" has the *only* complete line of "Electric Propelled" equipment from which to recommend the type and capacity best suited to your needs. Then, too! Each "AUTOMATIC" is designed and perfected for its specific job with the latest engineering features, offering production tools to do your job reliably at lowest cost. Whether it's travel—lift or maneuvering you will have the satisfaction of knowing every movement is being performed with precision, efficiency, and utmost speed with safety. You'll know that with "AUTOMATICS" on the job your materials handling will be accomplished expertly and economically as can only be done with "Electric Propelled" equipment.

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cut any size, min. width 24 ins., max. width 42 ins.

Whitaker Paper Co.	9.96c
Old Dominion Paper Co.	9.97c
Mudge Paper Co.	11.28c
R. P. Andrews Paper Co.	10.73c
Cauthorne Paper Co., Inc.	10.97c
Aetna Paper Co.	10.484c
Paper Corp. of U. S.	10.19c

75 Per Cent Rag Laid Antique Book

No. 23—10,000 lbs., 25x38—140; flat, cut 24x38 and 29x41 ins.; the laid marks to run the 24-inch and 29-inch direction of the sheet; the grain and chain marks to run lengthwise of the sheet.

Graham Paper Co.	12.87c
Mudge Paper Co.	13.87c
R. P. Andrews Paper Co.	11.97c
Cauthorne Paper Co., Inc.	12.49c
Aetna Paper Co.	12.484c
Paper Corp. of U. S.	11.67c

100 Per Cent Rag Antique Book

No. 24—5,000 lbs., 25x38—90; flat, cut 24x38 and 38x48 ins.; the grain to run lengthwise of the sheet. Min. order 5,000 lbs.

Cauthorne Paper Co., Inc.	18.47c
Paper Corp. of U. S.	17.97c
Lee Paper Co.	20.00c

No. 25—15,000 lbs., 25x38—140; flat, cut 24x38 and 38x48 ins.; the grain to run lengthwise of the sheet. Min. order 10,000 lbs.

Graham Paper Co.	19.24c
Cauthorne Paper Co.	17.97c
Paper Corp. of U. S.	17.47c
Lee Paper Co.	18.50c

Supercalendered Book

No. 26—1,000,000 lbs., 25x38—90; flat, cut 31¼x45½, 32x48, 34x44, 38x48 and 39x50 ins.

Mudge Paper Co.	5.295c
R. P. Andrews Paper Co.	5.37c
Frank Parsons Paper Co.	5.198c

No. 27—500,000 lbs., 25x38—100; flat cut 38x48 ins.

Old Dominion Paper Co.	5.534c
Mudge Paper Co.	5.19c
R. P. Andrews Paper Co.	5.24c
Stanford Paper Co.	5.41c
Marquette Paper Co.	5.11c

No. 28—300,000 lbs., 25x38—120 and 140; flat, cut 35x45, 38x48, 38x50, and 38x51 ins.

Old Dominion Paper Co.	5.534c
Mudge Paper Co.	5.13c
R. P. Andrews Paper Co.	5.14c
Stanford Paper Co.	5.17c
Frank Parsons Paper Co.	5.092c

No. 29—300,000 lbs., 25x38—90; rolls, 28½ and 38 ins. wide (3-inch fiber cores).

Mudge Paper Co.	4.98c
R. P. Andrews Paper Co.	4.98c
Marquette Paper Co.	4.762c

No. 30—600,000 lbs., 25x38—100; rolls, 28½ and 38 ins. wide (3-inch fiber cores).

Mudge Paper Co.	4.67c
R. P. Andrews Paper Co.	4.65c
Stanford Paper Co.	4.93c
Frank Parsons Paper Co.	4.718c

No. 31—600,000 lbs., 25x38—100; rolls, 28½ and 38 ins. wide (3-inch fiber cores).

Mudge Paper Co.	4.67c
R. P. Andrews Paper Co.	4.65c
Stanford Paper Co.	5.09c
Marquette Paper Co.	4.718c

Coated Book

No. 36—900,000 lbs., 25x38—140 and 160; flat, cut 24x32, 24x38, 29x41, 34x44, 38x48, 38x50 and 39x51 ins.; the grain to run lengthwise of the sheet.

Whitaker Paper Co.	6.91c
Walker-Goulard-Plehn Co.	7.02c
Thomas Barrett & Sons	7.02c
Perkins-Goodwin Co.	6.87c
Mudge Paper Co.	6.92c
R. P. Andrews Paper Co.	6.54c
Bulkley-Dunton & Co.	7.02c
Stanford Paper Co.	6.97c
Marquette Paper Co.	7.02c
Paper Corp. of U. S.	
(1st 3 months)	6.99c
(2nd 3 months)	7.49c
Butler Co.	6.821c

50 Per Cent Rag Coated Book

No. 37—100,000 lbs., 25x38—140 and 160; flat, cut 32x42 and 38x48 ins.; the grain to run lengthwise of the sheet.

Virginia Paper Co.	14.45c
Old Dominion Paper Co.	13.989c
Walker-Goulard Plehn Co.	13.99c
Thomas Barrett & Sons	13.99c
Mudge Paper Co.	12.81c
Bulkley-Dunton & Co.	13.99c
Stanford Paper Co.	14.23c
Marquette Paper Co.	13.99c
Barton, Duer & Koch Paper Co.	14.31c
Butler Co.	12.8421c

50 Per Cent Rag Machine-Finish Lithograph

No. 40—100,000 lbs., 25x38—160; flat, cut 10½x16 ins., the grain to run lengthwise of the sheet.

Whitaker Paper Co.	11.99c
Old Dominion Paper Co.	9.97c
Graham Paper Co.	11.08c
Mulge Paper Co.	10.06c
R. P. Andrews Paper Co.	10.17c
Aetna Paper Co.	10.474c
Paper Corp. of U. S.	10.19c

Mimeograph, White and Colored

No. 43—1,200,000 lbs., white, Nos. 40 and 48; flat, cut 24½x30½, 24½x32, 24½x38, 26x42½, and 28½x34½ ins.; the grain to run lengthwise of the sheet.

Whitaker Paper Co.	4.43c
Import Paper Co.	7.00c
Eastern Corp.	6.25c
Old Dominion Paper Co.	5.3639c
Perkins-Goodwin Co.	4.76c
R. P. Andrews Paper Co.	4.54c
Cauthorne Paper Co., Inc.	5.43c
Stanford Paper Co.	5.16c
Marquette Paper Co.	5.49c
Barton, Duer & Koch Paper Co.	4.62c

No. 44—150,000 lbs., blue, buff, green, pink and yellow, No. 40; flat, cut 24½x30½, 24½x32, 24½x38, and 26x42½ ins.; the grain to run lengthwise of the sheet. Min. order, one color, 10,000 lbs.

Import Paper Co.	7.75c
Eastern Corp.	6.74c
Virginia Paper Co.	7.82c
Walker Goulard Plehn Co.	7.45c
Cauthorne Paper Co., Inc.	6.21c
Stanford Paper Co.	6.89c
Aetna Paper Co.	6.424c

25 Per Cent Rag Mimeograph

No. 47—5,000,000 lbs., Nos. 40 and 48; flat, cut 24½x30½, 24½x32, 24½x38, 26x42½, and 28½x34½ ins.; the grain to run lengthwise of the sheet.

Old Dominion Paper Co.	7.82c
	8.07c
Cauthorne Paper Co., Inc.	
(250 tons)	7.99c
(250 additional tons)	8.16c
Aetna Paper Co.	7.734c
Paper Corp. of U. S.	
(1st 3 months)	7.96c
(2nd 3 months)	8.17c

Blue U S M O Safety Writing

No. 51—500,000 lbs., No. 32; rolls, 22 ins. wide, 24 ins. in diameter (3-inch fiber cores).

R. P. Andrews Paper Co.	11.26c

U S M O Writing, White and Blue

No. 52—5,000 lbs., No. 32; rolls, 8½ inches wide, 24 ins. in diameter (3-inch fiber cores). Min order, either color, 4,000 lbs.

R. P. Andrews Paper Co.	
(White)	10.26c
(Blue)	11.15c

Safety Writing Colored

No. 53—4,000 lbs., blue, gray, green, pink salmon, and yellow, No. 40; flat, cut 17x28, 21x32, and 22x34 ins. Min. order, one color, 2,000 lbs.

Whitaker Paper Co.	12.30c
R. P. Andrews Paper Co.	12.75c
Paper Corp. of U. S.	11.77c

Sulphite Writing, White and Colored

No. 54—200,000 lbs., white, No. 26; flat, cut 32x42 ins.

Whitaker Paper Co.	7.32c
Import Paper Co.	8.25c
George W. Millar Co.	7.55c
Old Dominion Paper Co.	7.3987c
Graham Paper Co.	7.40c
Mudge Paper Co.	7.45c
R. P. Andrews Paper Co.	6.21c
Bulkley-Dunton & Co.	7.55c
L. Hyman & Sons	7.55c
Stanford Paper Co.	7.55c
Barton, Duer & Koch Paper Co.	6.70c
Paper Corp. of U. S.	7.55c
Butler Co.	6.341c

No. 55—3,000,000 lbs., white, No. 32; flat, cut any size, min. width 21 ins., max. width 34 ins.

Whitaker Paper Co.	4.91c
Import Paper Co.	7.25c
George W. Millar Co.	6.95c
Old Dominion Paper Co.	6.794c
Perkins-Goodwin Co.	5.37c
Graham Paper Co.	6.81c
Mudge Paper Co.	5.84c
R. P. Andrews Paper Co. (½)	4.91c
(balance)	5.01c
Cauthorne Paper Co., Inc.	6.99c
Bulkley-Dunton & Co.	6.95c
L. Hyman & Sons	6.95c
Stanford Paper Co.	
(1,500,000 lbs.)	6.29c
(balance)	6.95c
Barton, Duer & Koch Paper Co.	5.44c
Paper Corp. of U. S.	6.95c

No. 56—5,000,000 lbs., white, Nos. 40 and 48; flat, cut any size, min. width 21 ins., max. width 41 ins.

Whitaker Paper Co.	4.87c
Import Paper Co.	7.25c
George W. Millar Co.	6.95c
Old Dominion Paper Co.	6.793c
Graham Paper Co.	6.81c
Mudge Paper Co.	5.84c
R. P. Andrews Paper Co. (½)	4.81c
(balance)	4.91c
Cauthorne Paper Co.	6.99c
Bulkley-Dunton & Co.	6.95c
L. Hyman & Sons	6.95c
Stanford Paper Co.	
(1,500,000 lbs.)	6.19c
(balance)	6.95c
Barton, Duer & Koch Paper Co.	
(2,100,000 lbs.)	5.158c
(balance)	5.34c
Paper Corp. of U. S.	6.95c

No. 57—100,000 lbs., white, No. 26; rolls, min. width 16 ins., max. width 38 ins. (3-inch fiber cores).

Whitaker Paper Co.	6.649c
Import Paper Co.	8.00c
George W. Millar Co.	6.80c
Old Dominion Paper Co.	6.017c
Graham Paper Co.	6.66c
Mudge Paper Co.	6.70c
R. P. Andrews Paper Co.	5.86c
Cauthorne Paper Co., Inc.	6.51c
Bulkley-Dunton & Co.	6.80c
L. Hyman & Sons	6.80c
Stanford Paper Co.	6.80c
Barton, Duer & Koch Paper Co.	6.40c
Paper Corp. of U. S.	6.80c
Butler Co.	5.90c

No. 58—800,000 lbs., white, No. 32; rolls, min. width 16 ins., max width 38 ins. (3-inch fiber cores).

Whitaker Paper Co.	4.49c
Import Paper Co.	7.00c
George W. Millar Co.	6.30c
Old Dominion Paper Co.	5.2799c
Walker-Goulard-Plehn Co.	5.95c
Perkins-Goodwin Co.	4.87c
Graham Paper Co.	6.17c
Mudge Paper Co.	5.52c
R. P. Andrews Paper Co.	4.61c
Cauthorne Paper Co., Inc.	5.73c
Bulkley-Dunton & Co.	6.30c
L. Hyman & Sons	6.30c
Stanford Paper Co.	5.94c

Barton, Duer & Koch Paper Co.	5.27c
Paper Corp. of U. S.	6.30c

No. 59—60,000 lbs., white, Nos. 40 and 48; rolls, min. width 16 ins., max. width 38 ins. (3-inch fiber cores).

Whitaker Paper Co.	5.35c
Import Paper Co.	7.00c
Old Dominion Paper Co.	5.289c
Walker-Goulard-Plehn Co.	5.85c
R. P. Andrews Paper Co.	5.24c
Cauthorne Paper Co., Inc.	5.73c
Paper Corp. of U. S.	6.30c

No. 60—140,000 lbs., blue, buff, cherry, green, pink, salmon and yellow, No. 26; flat, cut any size, min. width 21 ins., max width 34 ins. Min. order, one color, 5,000 lbs.

Import Paper Co.	9.00c
R. P. Andrews Paper Co.	7.19c
Cauthorne Paper Co., Inc.	7.51c
Aetna Paper Co.	7.164c
Paper Corp. of U. S.	8.75c
Butler Co.	7.21c

No. 61—1,750,000 lbs., blue, buff, cherry, green, pink, salmon and yellow Nos. 32 and 40; flat, cut any size, min. width 21 ins., max. width 34 ins. Min. order, one color, 10,000 lbs.

Whitaker Paper Co.	7.12c
Import Paper Co.	8.00c
George W. Millar Co.	7.35c
Virginia Paper Co.	7.05c
Old Dominion Paper Co.	6.9979c
Perkins-Goodwin Co.	7.19c
Graham Paper Co.	7.20c
Mudge Paper Co.	7.07c
Cauthorne Paper Co., Inc.	7.19c
Bulkley-Dunton & Co.	7.35c
L. Hyman & Sons	7.35c
Stanford Paper Co.	7.35c
Marquette Paper Co.	7.04c
Aetna Paper Co. (250 tons)	6.844c
(balance)	7.194c
Paper Corp. of U. S.	7.35c

No. 62—600,000 lbs., yellow, No. 32; rollers, 32 and 38 ins. (3-inch fiber cores).

Whitaker Paper Co.	5.59c
Import Paper Co.	7.75c
George W. Millar Co.	6.60c
Old Dominion Paper Co.	6.5084c
	6.5498c
Walker-Goulard-Plehn Co.	6.45c
Perkins-Goodwin Co.	6.564c
Graham Paper Co.	6.57c
Mudge Paper Co.	6.52c
R. P. Andrews Paper Co.	5.69c
Cauthorne Paper Co. Inc.	6.54c
Bulkley-Dunton & Co.	6.70c
L. Hyman & Sons	6.70c
Stanford Paper Co.	6.70c
Barton, Duer & Koch Paper Co.	6.39c
Aetna Paper Co.	6.744c
Paper Corp. of U. S.	6.95c
Butler Co.	6.08c

100 Per Cent Rag White Writing

No. 63—2,500 lbs., No. 56; flat, cut 21x32 ins. Min. order 2,500 lbs.

R. P. Andrews Paper Co.	22.19c
Stanford Paper Co.	24.38c
Barton, Duer & Koch Paper Co.	22.95c
Lee Paper Co.	26.50c

Lithograph-Finish Map

No. 64—2,500 lbs. No. 56; flat, cut 21x32 ins. Min. order 2,500 lbs.

Old Dominion Paper Co.	9.739c

50 Per Cent Rag Lithograph-Finish Map

No. 65—200,000 lbs., Nos. 40, 48 and 56; flat, cut any size, min. width 22 ins., max. width, 48 ins., the grain to run lengthwise of the sheet.

Old Dominion Paper Co.	10.864c
	11.294c
Walker-Goulard-Plehn Co.	13.54c
Graham Paper Co. (100,000 lbs. only)	11.72c
R. P. Andrews Paper Co.	13.47c
Stanford Paper Co.	10.40c
Barton, Duer & Koch Paper Co.	11.35c
Aetna Paper Co.	11.754c
Paper Corp. of U. S.	13.75c

75 Per Cent Rag Lithograph-Finish Map

No. 66—300,000 lbs., Nos. 32 and 40; flat, cut any size, min. width 24 ins., max. width 48 ins.; the grain to run lengthwise of the sheet.

Walker-Goulard-Plehn Co.	17.10c
Graham Paper Co. (100,000 lbs. only)	14.28c
Mudge Paper Co.	12.03c
R. P. Andrews Paper Co.	15.47c
Chicago Paper Co.	12.13c
Barton, Duer & Koch Paper Co.	13.20c
	13.70c
Aetna Paper Co.	14.254c
Paper Corp. of U. S.	15.25c

No. 67—50,000 lbs., Nos. 48 and 56; flat, cut any size, min. width 22 ins., max. width 48 ins.; the grain to run lengthwise of the sheet. Min. order, one substance, 5,000 lbs.

Walker-Goulard-Plehn Co.	17.10c
Graham Paper Co.	13.98c
Mudge Paper Co.	11.73c
R. P. Andrews Paper Co.	15.47c
Chicago Paper Co.	11.87c
Barton, Duer & Koch Paper Co.	12.96c
Aetna Paper Co.	14.254c
Paper Corp. of U. S.	14.95c

100 Per Cent Lag White Chart, Lithograph-Finish

No. 69—400,000 lbs., No. 83 and 96; flat, cut any size, min. width 22 ins., max. width 46 ins.; packed in cases of 1,000 sheets each; the grain to run lengthwise of the sheet unless otherwise specified.

Walker-Goulard-Plehn Co.	22.65c
Graham Paper Co. (200,000 lbs. only)	22.08c
R. P. Andrews Paper Co.	18.07c
	18.57c
Barton, Duer & Koch Paper Co.	16.44c
	17.35c
Paper Corp. of U. S.	17.35c

Sulphite Manifold, White and Colored

No. 70—130,000 lbs., white, No. 18; flat, cut 21x32, 22x34, and 28x34 ins.; the grain to run the 21-inch way on the 21x32-inch size.

Whitaker Paper Co.	8.05c
Import Paper Co.	8.10c
George W. Millar Co.	8.25c
Old Dominion Paper Co.	7.492c
Walker-Goulard-Plehn Co.	7.47c
Perkins-Goodwin Co.	8.078c
Graham Paper Co.	8.00c
Mudge Paper Co.	8.03c
Enterprise Paper Co.	7.649c
Bulkley-Dunton & Co.	8.25c
L. Hyman & Sons	7.50c
Stanford Paper Co.	8.25c
Marquette Paper Co.	7.98c
Mathers-Lamm Paper Co.	7.35c
Paper Corp. of U. S.	7.74c

No. 71—50,000 lbs., blue, buff, green, pink, salmon and yellow, No. 18; flat, cut 21x32, 22x34, and 28x34 ins.; the grain to run the 21-inch way on the 21x32-inch size. Min. order, one color, 5,000 lbs.

Whitaker Paper Co.	9.75c
Import Paper Co.	8.85c
Old Dominion Paper Co.	7.98c
	8.49c
Walker-Goulard-Plehn Co.	7.97c
Graham Paper Co.	8.75c
Enterprise Paper Co.	8.159c
L. Hyman & Sons	8.00c
Marquette Paper Co.	8.48c
Mathers-Lamm Paper Co.	7.99c
Paper Corp. of U. S.	8.49c

50 Per Cent Rag Manifold, White and Colored

No. 73—100,000 lbs., white, No. 14; flat, cut 21x32, 22x34, 28x34 and 38x48 ins.; the grain to run the 21-inch way on the 21x32-inch size. Min. order, 5,000 lbs.

R. P. Andrews Paper Co.	16.87c
Marquette Paper Co.	15.95c
Barton, Duer & Koch Paper Co.	16.29c

No. 74—800,000 lbs., white, No. 18; flat, cut 21x32, 22x34, 24x38 and 28x34 ins.; the grain to run the 21-inch way on the 21x32-inch size.

Mudge Paper Co. (300,000 lbs.)	12.48c
(150,000 lbs. only)	12.83c
(300,000 lbs.)	13.11c
Stanford Paper Co.	12.97c
	13.47c
	14.47c
	15.97c
Marquette Paper Co.	15.46c
Barton, Duer & Koch Paper Co.	12.83c
	12.97c
	13.12c
	13.36c

No. 75—30,000 lbs., blue, buff, cherry, green, pink, salmon and yellow, No. 14; flat, cut 21x32, 22x34, and 28x34 ins.; the grain to run the 21-inch way on the 21x32-inch size. Min. order, one color, 3,000 lbs.

R. P. Andrews Paper Co.	17.93c
Marquette Paper Co.	17.25c
Barton, Duer & Koch Co.	17.34c

No. 76—300,000 lbs., blue, buff, cherry, green, pink, salmon and yellow, No. 18; flat, cut 21x32, 22x34, 24x38 and 28x34 ins.; the grain to run the 21-inch way on the 21x32-inch size. Min. order, one color, 5,000 lbs.

Graham Paper Co. (150,000 lbs. only)	14.90c
R. P. Andrews Paper Co.	15.17c
Stanford Paper Co.	13.62c
Marquette Paper Co.	15.23c
Barton, Duer & Koch Paper Co.	13.02c
Lee Paper Co.	15.96c

100 Per Cent Rag White Manifold

No. 78—5,000 lbs., No. 14; flat, cut 17x28, 19x24, 21x32, and 22x34 ins.; the grain to run the 21-inch way on the 21-32-inch size. Min. order, 5,000 lbs.

Whitaker Paper Co.	31.00c
Old Dominion Paper Co.	29.84c
R. P. Andrews Paper Co.	26.43c
Barton, Duer & Koch Paper Co.	31.95c

No. 79—40,000 lbs., No. 18; flat, cut 17x28, 19x24, 21x32 and 22x34 ins.; the grain to run the 21-inch way on the 21x32 ins. size, Min. order 5,000 lbs.

Whitaker Paper Co.	26.00c
Old Dominion Paper Co.	22.9188c
R. P. Andrews Paper Co.	24.07c
Barton, Duer & Koch Paper Co.	22.45c
Lee Paper Co.	25.96c

50 Per Cent Rag White Glazed Manifold

No. 83—300,000 lbs., No. 16; flat cut 19x24 and 21x32 ins.; the grain to run the 21-inch way on the 21x32-inch size. Min. order 20,000 lbs.

R. P. Andrews Paper Co.	
(100,000 lbs.)	15.50c
(100,000 lbs.)	16.00c
(balance)	16.50c
Barton, Duer & Koch Paper Co.	
(150,000 lbs.)	14.93c
(150,000 lbs.)	15.97c

Sulphite White Bond

No. 102—1,000,000 lbs., No. 40; flat, cut any size, min. width 21 ins.; max. width 37 ins.

Whitaker Paper Co.	6.44c
Eastern Corp.	5.98c
George W. Millar Co.	7.20c
Old Dominion Paper Co.	6.2424c
Walker-Goulard-Plehn Co.	6.55c
Perkins-Goodwin Co.	7.053c
Graham Paper Co.	7.06c
Mudge Paper Co.	5.99c
R. P. Andrews Paper Co.	5.69c
Bulkley-Dunton & Co.	7.20c
L. Hyman & Sons	7.20c
Stanford Paper Co.	7.20c
Marquette Paper Co.	6.64c
Barton, Duer & Koch Paper Co.	6.13c
Paper Corp. of U. S.	7.20c

25 Per Cent Rag Bond, White and Colored

No. 109—150,000 lbs., white, No. 26; flat, cut any size, min. width 21 ins.; max. width 34 ins.

Stanford Paper Co.	10.67c
Aetna Paper Co.	10.794c

No. 110—800,000 lbs., white, No. 32; flat, cut any size, min. width 21 ins., max. width 34 ins.

Virginia Paper Co.	(200,000 lbs.)	9.70c
	(200,000 lbs.)	10.15c
	(400,000 lbs.)	10.65c
Graham Paper Co.		9.31c
		9.69c
Chicago Paper Co.		10.17c
Aetna Paper Co.		9.864c

No. 111—1,700,000 lbs., white, No. 40; flat, cut any size, min. width 21 ins., max. width 34 ins.

Aetna Paper Co.	(300 tons)	8.534c
	(550 tons)	9.374c
Butler Co.	(150 tons)	8.37c
	(400 tons)	8.57c
	(300 tons)	9.43c

No. 112—1,700,000 lbs., white, No. 40; flat, cut any size, min. width 21 ins., max. width 34 ins.

Barton, Duer & Koch Paper Co.		9.57c
Aetna Paper Co.	(300 tons)	8.534c
	(550 tons)	9.374c
Butler Co.	(150 tons)	8.37c
	(400 tons)	8.57c
	(300 tons)	9.43c

No. 113—400,000 lbs., white, No. 48; flat, cut any size, min. width 21 ins., max. width 34 ins.

Walker-Goulard-Plehn Co.	11.19c
R. P. Andrews Paper Co.	9.17c
Stanford Paper Co.	9.40c
Aetna Paper Co.	8.614c
Butler Co.	8.76c

No. 114—150,000 lbs., blue, buff, cherry, green, pink, salmon and yellow, No. 26; flat, cut any size, min. width 21 ins., max. width 34 ins. Min. order, one color, 5,000 lbs.

Stanford Paper Co.	12.40c
Aetna Paper Co.	11.644c
Butler Co.	11.94c

No. 115—700,000 lbs., blue, buff, cherry, green, pink, salmon and yellow, No. 32; flat, cut any size, min. width 21 ins., max. width 34 ins.

Baxter Paper Co.	11.54c
Old Dominion Paper Co.	9.7197c
Mudge Paper Co.	9.78c
	10.58c
Stanford Paper Co.	10.10c
Aetna Paper Co.	9.624c

No. 116—900,000 lbs., blue, buff, cherry, green, pink, salmon and yellow No. 40; flat, cut any size min. width 21 ins., max. width 34 ins.

Baxter Paper Co.		8.96c
Walker-Goulard-Plehn Co.		11.69c
Graham Paper Co.		8.99c
Stanford Paper Co.		9.90c
Aetna Paper Co.	(200 tons)	8.534c
	(balance)	8.974c

No. 117—

Baxter Paper Co.	9.66c
Walker-Goulard-Plehn Co.	11.69c
Stanford Paper Co.	10.10c
Aetna Paper Co.	10.474c

50 Per Cent Rag Bond, White and Colored

No. 120—200,000 lbs., white, No. 26; flat, cut any size, min. width 21 ins., max. width 34 ins.

R. P. Andrews Paper Co.	13.11c
Barton, Duer & Koch Paper Co.	13.75c
Aetna Paper Co.	11.974c

No. 121—1,000,000 lbs., white, Nos. 32 and 40; flat, cut any size, min. width 21 ins., max. width 34 ins.

R. P. Andrews Paper Co.	(half)	9.77c
	(balance)	10.57c
Barton, Duer & Koch Paper Co.		11.75c
Aetna Paper Co.	(200 tons)	9.464c
	(balance)	10.124c
Butler Co.	(250 tons)	9.59c
	(250 tons)	9.89c

No. 122—150,000 lbs., white, No. 48; flat, cut any size, min. width 21 ins., max. width 34 ins.

Walker-Goulard-Plhen Co.	13.45c
R. P. Andrews Paper Co.	9.57c
Barton, Duer & Koch Paper Co.	11.75c
Aetna Paper Co.	9.624c

No. 123—15,000 lbs., blue, buff, cherry, green, pink, salmon and yellow, Nos. 32 and 40; flat, cut any size, min. width 21 ins., max. width 34 ins. Min. order, one color, one substance, 2,500 lbs.

R. P. Andrews Paper Co.	14.37c
Mathers-Lamm Paper Co.	13.29c
Barton, Duer & Koch Paper Co.	13.00c
Aetna Paper Co.	12.974c

75 Per Cent Rag White Bond

No. 125—2,500 lbs., No. 26; flat, cut any size, min. width 21 ins., max. width 32 ins. Min. order, 2,500 lbs.

Graham Paper Co.	22.27c
Stanford Paper Co.	22.76c
Paper Corp. of U. S.	20.40c

No. 126—2,500 lbs., Nos. 32, 40, and 48; flat, cut any size, min. width 21 ins., max. width 32 ins. Min. order, one substance, 2,500 lbs.

Graham Paper Co.	19.15c
Stanford Paper Co.	20.32c
Paper Corp. of U. S.	18.10c

100 Per Cent Rag White Bond

No. 128—5,000 lbs., Nos. 32 and 40; flat, cut any size, min. width 16 ins., max. width 32 ins. Min order, one substance, 2,000 lbs.

Walker-Goulard-Plehn Co.	23.10c
R. P. Andrews Paper Co.	21.23c
Stanford Paper Co.	21.75c
Barton, Duer & Koch Paper Co.	22.95c
Paper Corp. of U. S.	19.90c

No. 129—5,000 lbs., No. 48; flat cut any size, min. width 16 ins., max. width 32 ins. Min. order, 2,000 lbs.

Walker-Goulard-Plehn Co.	23.10c
R. P. Andrews Paper Co.	21.23c
Stanford Paper Co.	21.75c
Barton, Duer & Koch Paper Co.	22.95c
Paper Corp. of U. S.	19.90c

100 Per Cent Rag Declaration Bond

No. 140—8,000 lbs., Nos. 32 and 40; flat, cut 17x22 and 22x25½ ins. Min. order, one substance, 3,000 lbs.

R. P. Andrews Paper Co.	25.97c
Stanford Paper Co.	24.50c

100 Per Cent Rag Parchment Deed

No. 141—2,000 lbs., No. 64; flat, cut 33x34 ins. Min. order, 2,000 lbs.

Walker-Goulard-Plehn Co.	25.00c
R. P. Andrews Paper Co.	23.80c
Stanford Paper Co.	21.73c
Barton, Duer & Koch Paper Co.	22.95c
Paper Corp. of U. S.	20.40c

Sulphite White Ledger

No. 151—120,000 lbs., Nos. 56 and 64; flat, cut any size, min. width 17 ins., max. width 32 ins. Min. order, one substance, 10,000 lbs.

Whitaker Paper Co.	6.89c
Import Paper Co.	8.00c
Eastern Corp.	6.74c
George W. Millar Co.	7.20c
Old Dominion Paper Co.	7.047c
Walker-Goulard-Plehn Co.	6.45c
Perkins-Goodwin Co.	7.053c
Graham Paper Co.	7.06c
Mudge Paper Co.	6.04c
Bulkley-Dunton & Co.	7.20c
L. Hyman & Sons	7.20c
Stanford Paper Co.	6.24c
Marquette Paper Co.	6.66c
Barton, Duer & Koch Paper Co.	6.78c
Aetna Paper Co.	7.114c
Paper Corp. of U. S.	7.20c

No. 152—300,000 lbs., No. 80; flat, cut any size, min. width 17 ins., max. width 32 ins.

Whitaker Paper Co.	6.89c
Import Paper Co.	7.75c
Eastern Corp.	6.98c
George W. Millar & Co.	7.20c
Old Dominion Paper Co.	7.047c
Walker-Goulard-Plehn Co.	6.53c
Perkins-Goodwin Co.	7.053c
Graham Paper Co.	7.06c
Mudge Paper Co.	6.01c
Bulkley-Dunton & Co.	7.20c
L. Hyman & Sons	7.20c
Stanford Paper Co.	6.24c
Marquette Paper Co.	6.66c
Barton, Duer & Koch Paper Co.	6.78c
Aetna Paper Co.	7.114c
Paper Corp. of U. S.	7.20c

25 Per Cent Rag Ledger, White and Colored

No. 154—90,000 lbs., white, Nos. 48 and 56; flat, cut 20x28, 21x32, 24x38, 28x29 and 28x34 ins. Min. order, one substance, 5,000 lbs.

Baxter Paper Co.	9.17c
Walker-Goulard-Plehn Co.	11.24c
Mudge Paper Co.	9.37c
Mathers-Lamm Paper Co.	9.41c
Barton, Duer & Koch Paper Co.	10.40c
Aetna Paper Co.	9.464c

No. 155—5,000 lbs., white, No. 64; flat, cut 21x32 and 23x36 ins. Min. order, 5,000 lbs.

Walker-Goulard-Plehn Co.	11.24c
Mudge Paper Co.	9.76c
Mather-Lamm Paper Co.	9.65c
Barton, Duer & Koch Paper Co.	10.90c
Aetna Paper Co.	10.124c

No. 156—15,000 lbs., white, No. 72; flat, cut 20x28, 21x32, 24x38, and 28x34 ins. Min. order, 5,000 lbs.

Walker-Goulard-Plehn Co.	11.24c
Mudge Paper Co.	9.76c
Mathers-Lamm Paper Co.	9.65c
Barton, Duer & Koch Paper Co.	11.90c
Aetna Paper Co.	10.124c

No. 157—40,000 lbs., blue, buff, green, pink, salmon and yellow, Nos. 56, 64, and 72; flat, cut 21x32, 23x36, 24x38, 26x36, and 28x34 ins. Min. order, one substance, one color, 3,000 lbs.

Old Dominion Paper Co.	10.949c
Walker-Goulard-Plehn Co.	11.74c
Graham Paper Co.	11.86c
Barton, Duer & Koch Paper Co.	11.90c
Aetna Paper Co.	11.844c

50 Per Cent Rag Ledger, White and Colored

No. 160—300,000 lbs., white, Nos. 48 and 56; flat, cut 18½x36, 18½x40¼, 20x28, 21x32, 24x38, 28x29, 28x34 and 29x41 ins. Min. order, one substance, 10,000 lbs.

Old Dominion Paper Co.	10.788c
Baxter Paper Co.	9.56c
Walker-Goulard-Plehn Co.	13.69c
Mudge Paper Co.	9.64c
R. P. Andrews Paper Co.	13.37c
Barton, Duer & Koch Paper Co.	11.25c
Aetna Paper Co.	10.464c

No. 161—100,000 lbs., white, No. 64; flat, cut 21x32 and 23x36 ins. Min. order, 10,000 lbs.

Baxter Paper Co.	9.86c
Old Dominion Paper Co.	10.788c
Walker-Goulard-Plehn Co.	13.69c
Mudge Paper Co.	9.66c
R. P. Andrews Paper Co.	13.37c
Barton, Duer & Koch Paper Co.	11.20c
Aetna Paper Co.	10.464c

No. 162—80,000 lbs., white, Nos. 72 and 80; flat, cut 20x28, 21x32, 24x38. 28x34 and 38x48 ins. Min. order, 10,000 lbs.

Baxter Paper Co.	10.00c
Old Dominion Paper Co.	10.788c
Walker-Goulard-Plehn Co.	13.69c
Mudge Paper Co.	9.66c
R. P. Andrews Paper Co.	13.37c
Barton, Duer & Koch Paper Co.	11.20c
Aetna Paper Co.	10.464c

No. 163—100,000 lbs., white, No. 88; flat, cut 21x32½ ins. Min. order, 10,000 lbs.

Baxter Paper Co.	10.96c
Old Dominion Paper Co.	10.788c
Walker-Goulard-Plehn Co.	13.69c
Mudge Paper Co.	9.76c
R. P. Andrews Paper Co.	13.37c
Barton, Duer & Koch Paper Co.	11.00c
Aetna Paper Co.	10.464c

No. 164—150,000 lbs. blue, buff, cherry, green, pink, salmon and yellow, Nos. 56, 64, and 72; flat cut

Beg your pardon!

We've Underrated the R & M

MOYNO PUMP

WE'VE been calling it the Moyno *Slip* Pump. But leading paper mills insist we're too modest—have written us about it.

"Yes, it does handle slip better than any pump we have ever used," dozens of satisfied users report. "But it does a wonderful job, too, with size and coating—in fact, anything up to and including stock. So why call it just a slip pump? You're too modest. Give your pump credit where credit is due."

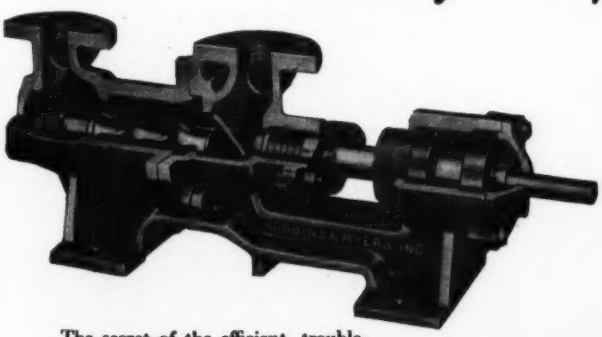
UNIFORM DELIVERY—IMPROVED PAPER QUALITY

Profit from the experiences of leading paper mills. Use the Moyno Pump wherever you have a pumping job to do in your plant.

It delivers a uniform flow, regardless of the viscosity of the liquid. Smooth, easy-operating mechanism reduces your power costs. There are no valves or pistons to stick, leak, clog or wear out. Repairs, when necessary, are quickly made . . . parts easily replaced.

The patented principle of a single-thread helical rotor revolving within a double-threaded helical stator forces liquids gently forward. Action is like that of a piston moving constantly in one direction through a cylinder of infinite length. You get metered delivery . . . uniform feed to coating rolls, resulting in improved paper quality. Entrust your pumping jobs to R & M Moyno Pumps.

Write for Complete Details . . .



The secret of the efficient, trouble-free performance of the Moyno Pump is in the pumping action of the helical rotor and stator shown at the left above. Note the simplicity of construction—the minimum of working parts.

Why let pumping troubles cost you money and valuable time . . . endanger the quality of your products? Get complete details on the remarkable new Moyno Pump today. Simply write for R & M Moyno Pump Folder No. 1777. Do it today.

ROBBINS & MYERS, Inc.

MOYNO PUMP DIVISION SPRINGFIELD, OHIO

18½x36, 18½x40¼, 19x24, 21x32, 23x36, and 28x34 ins. Min. order, one substance, one color, 5,000 lbs.

Baxter Paper Co.	10.36c
Walker-Goulard-Plehn Co.	14.19c
Mudge Paper Co.	10.64c
Mathers-Lamm Paper Co.	11.48c
Barton, Duer & Koch Paper Co.	11.55c
Aetna Paper Co.	10.924c

No. 165—50,000 lbs. blue, buff, cherry, fawn, green, pink, salmon and yellow. No. 88; flat, cut 21x32½ ins. Min. order, one color, 5,000 lbs.

Baxter Paper Co.	11.24c
Walker-Goulard-Plehn Co.	14.19c
Mudge Paper Co.	10.64c
Mathers-Lamm Paper Co.	11.12c
Barton, Duer & Koch Paper Co.	11.55c
Aetna Paper Co.	10.924c

75 Per Cent Rag Ledger, White and Colored

No. 168—20,000 lbs., white, Nos. 48 and 56; flat, cut 21x32, 24x38, 28x29, and 28x34 ins. Min. order, one substance, 4,000 lbs.

Baxter Paper Co.	14.46c
Walker-Goulard-Plehn Co.	16.85c
Graham Paper Co.	16.09c
Mudge Paper Co.	14.12c
R. P. Andrews Paper Co.	16.37c
Stanford Paper Co.	15.63c
Barton, Duer & Koch Paper Co.	14.65c
Aetna Paper Co.	15.104c
Paper Corp. of U. S.	16.25c

No. 169—20,000 lbs., white, No. 64; flat, cut 21x32, 23x36, 24x38, and 28x34 ins. Min. order, 5,000 lbs.

Baxter Paper Co.	14.46c
Walker-Goulard-Plehn Co.	16.85c
Graham Paper Co.	16.09c
Mudge Paper Co.	14.12c
Graham Paper Co.	16.37c
Stanford Paper Co.	15.63c
Barton, Duer & Koch Paper Co.	14.65c
Aetna Paper Co.	15.104c
Paper Corp. of U. S.	16.25c

No. 170—30,000 lbs., white, Nos. 72 and 80; flat, cut 20x28, 21x32, 24x38, and 28x34 ins. Min. order, one substance, 5,000 lbs.

Baxter Paper Co.	14.46c
Walker-Goulard-Plehn Co.	16.85c
Graham Paper Co.	16.09c
Mudge Paper Co.	14.12c
Graham Paper Co.	16.37c
Stanford Paper Co.	15.63c
Barton, Duer & Koch Paper Co.	14.35c
Aetna Paper Co.	15.104c
Paper Corp. of U. S.	16.25c

No. 171—50,000 lbs., white, No. 88; flat, cut 21x32½ ins. Min. order, 5,000 lbs.

Baxter Paper Co.	14.46c
Walker-Goulard-Plehn Co.	16.85c
Graham Paper Co.	16.02c
Mudge Paper Co.	14.12c
R. P. Andrews Paper Co.	16.37c
Stanford Paper Co.	15.63c
Barton, Duer & Koch Paper Co.	14.35c
Aetna Paper Co.	15.104c
Paper Corp. of U. S.	16.25c

No. 172—40,000 lbs., blue, buff, cherry, green, pink, salmon and yellow, Nos. 56, 64, and 72; flat, cut 21x32, 23x36, 24x38, and 28x34 ins. Min. order, one substance, one color, 3,000 lbs.

Walker-Goulard-Plehn Co.	17.35c
Graham Paper Co.	16.47c
Stanford Paper Co.	15.85c
Barton, Duer & Koch Paper Co.	15.45c
Aetna Paper Co.	16.104c
Paper Corp. of U. S.	17.25c

No. 173—12,000 lbs., blue, buff, cherry, fawn, green, pink, salmon and yellow, No. 88; flat, cut 21x32½ ins. Min. order, one color, 4,000 lbs.

Walker-Goulard-Plehn Co.	17.35c
Graham Paper Co.	16.41c
Stanford Paper Co.	15.85c
Barton, Duer & Koch Paper Co.	15.45c
Aetna Paper Co.	16.104c
Paper Corp. of U. S.	17.25c

100 Per Cent Rag White Ledger

No. 176—100,000 lbs., No. 48; flat, cut 21x32, 22¼x31½, 23x36, 24x38, and 28x34 ins. Min. order, 4,000 lbs.

Walker-Goulard-Plehn Co.	23.15c
Graham Paper Co.	18.39c
R. P. Andrews Paper Co.	20.03c
Stanford Paper Co.	20.70c
Barton, Duer & Koch Paper Co.	18.42c
Paper Corp. of U. S.	19.12c

No. 177—70,000 lbs., No. 56; flat, cut 20x28, 21x32, 23x36, 24x38, and 28x34 ins. Min. order 5,000 lbs.

Walker-Goulard-Plehn Co.	23.15c
Graham Paper Co.	18.39c
R. P. Andrews Paper Co.	20.53c
Stanford Paper Co.	20.70c
Barton, Duer & Koch Paper Co.	18.42c
Paper Corp. of U. S.	19.12c

No. 178—50,000 lbs., No. 64; flat, cut 18½x42, 21x32, 23x36, and 28x34 ins. Min. order, 5,000 lbs.

Walker-Goulard-Plehn Co.	23.15c
Graham Paper Co.	18.39c
R. P. Andrews Paper Co.	20.53c
Stanford Paper Co.	20.70c
Barton, Duer & Koch Paper Co.	18.92c
Paper Corp. of U. S.	19.12c

No. 179—15,000 lbs., No. 72; flat, cut 20x28, 21x32, 24x38, and 28x34 ins. Min. order, 5,000 lbs.

Walker-Goulard-Plehn Co.	23.15c
Graham Paper Co.	18.39c
R. P. Andrews Paper Co.	20.83c
Stanford Paper Co.	20.70c
Barton, Duer & Koch Paper Co.	18.92c
Paper Corp. of U. S.	19.12c

No. 180—15,000 lbs., No. 80; flat, cut 21x32½ and 21x42 ins. Min. order, 4,000 lbs.

Walker-Goulard-Plehn Co.	23.15c
R. P. Andrews Paper Co.	20.43c
Stanford Paper Co.	20.70c
Barton, Duer & Koch Paper Co.	18.92c
Paper Corp. of U. S.	19.12c

No. 181—15,000 lbs., No. 88; flat, cut 20½x24¾, 21x32½ and 22¾x31½ ins. Min. order, 5,000 lbs.

Walker-Goulard-Plehn Co.	23.15c
R. P. Andrews Paper Co.	20.43c
Stanford Paper Co.	20.70c
Barton, Duer & Koch Paper Co.	18.92c
Paper Corp. of U. S.	19.12c

Sulphite White Index

No. 184—400,000 lbs., 22¾x28½—182 and 230; flat, cut 21x32½, 22½x28½, 24½x32½ and 32½x48½ ins., with projecting colored-paper marker between each 100 sheets. Min. order, one weight, 10,000 lbs.

Whitaker Paper Co.	5.38c
George W. Millar Co.	6.80c
Virginia Paper Co.	6.18c
Old Dominion Paper Co.	6.6498c
Walker-Goulard-Plehn Co.	6.46c
Perkins, Goodwin Co.	6.662c
Graham Paper Co.	6.18c
Mudge Paper Co.	6.44c
R. P. Andrews Paper Co.	5.63c
Cauthorne Paper Co., Inc.	6.89c
Bulkley-Dunton & Co.	6.80c
L. Hyman & Sons	6.80c
Stanford Paper Co.	6.55c
Marquette Paper Co.	5.92c
Paper Corp. of U. S.	5.24c

50 Per Cent Rag Index, White and Colored

No. 190—500,000 lbs., white, 22½x28½—182 and 230; flat, cut 21x32½, 22½x28½ and 24½x32½ ins., with projecting colored-paper marker between each 100 sheets. Min. order, one weight, 10,000 lbs.

Old Dominion Paper Co.	9.57c 10.12c
Walker-Goulard-Plehn Co.	12.86c
Mudge Paper Co.	10.97c
R. P. Andrews Paper Co.	10.97c
Stanford Paper Co.	12.80c
Barton, Duer & Koch Paper Co.	9.50c
Aetna Paper Co.	9.474c
Paper Corp. of U. S.	8.70c

No. 191—50,000 lbs., white, 22½x28½—280 and 362; flat, cut 21x32½ and 22½x28½ ins., with projecting colored-paper marker between each 100 sheets. Min. order, one weight, 5,000 lbs.

Walker-Goulard-Plehn Co.	13.41c
Stanford Paper Co.	13.35c
Barton, Duer & Koch Paper Co.	13.66c
Paper Corp. of U. S.	9.70c

No. 192—450,000 lbs., blue, buff, fawn, green, pink, salmon and yellow, 22½x28½—182 and 230; flat, cut 21x32½ and 22½x28½ ins., with projecting colored-paper marker between each 100 sheets. Min. order, one color, one weight, 5,000 lbs.

Old Dominion Paper Co.	9.57c 10.12c
Walker-Goulard-Plehn Co.	13.36c
Mudge Paper Co.	11.58c
R. P. Andrews Paper Co.	11.58c
Stanford Paper Co.	13.30c
Marquette Paper Co.	10.60c
Barton, Duer & Koch Paper Co.	9.72c
Aetna Paper Co.	9.624c
Paper Corp. of U. S.	8.95c

No. 193—150,000 lbs., blue, buff, fawn, green, pink, salmon and yellow, 22½x28½—280 and 362; flat, cut 21x32½ and 22½x28½ ins., with projecting colored-paper marker between each 100 sheets. Min. order, one color, one weight, 5,000 lbs.

Walker-Goulard-Plehn Co.	13.91c
Stanford Paper Co.	13.85c
Barton, Duer & Koch Paper Co.	13.86c
Paper Corp. of U. S.	9.75c

100 Per Cent Rag White Index

No. 196—120,000 lbs., 22½x28½—approximately 206; flat, cut 20½x30½ and 21x32½ ins.

Walker-Goulard-Plehn Co.	20.84c
Mudge Paper Co.	19.74c
R. P. Andrews Paper Co.	18.93c
Stanford Paper Co.	20.78c
Marquette Paper Co.	17.94c
Mathers-Lamm Paper Co.	20.88c
Barton, Duer & Koch Paper Co.	17.88c
Paper Corp. of U. S.	18.47c

White Tissue

No. 197—4,000 lbs., flat, 21x32—18. Min. order 1,000 lbs.

Old Dominion Paper Co.	12.33c
L. Hyman & Sons	12.24c
Mathers-Lamm Paper Co.	12.10c

Facing Stereo Tissue

No. 198—500 lbs., 19x24—9; rolls 24 in. wide (3-inch fiber cores). Min. order, 500 lbs.

No. bids.

Coated Cover, White and Colored

No. 201—40,000 lbs., white, 20x26—130 and 160; flat, 26½x41 ins., the grain to run lengthwise of the sheet. Min. order, 5,000 lbs.

Whitaker Paper Co.	7.25c
Virginia Paper Co.	7.25c
Walker-Goulard-Plehn Co.	7.29c
Thomas Barrett & Sons	7.29c
Bulkley-Dunton & Co.	7.29c
Stanford Paper Co.	7.54c
Marquette Paper Co.	7.29c
Barton, Duer & Koch Paper Co.	7.18c
Paper Corp. of U. S.	7.70c
Butler Co.	7.29c

No. 202—50,000 lbs., India tint, light green, and emerald green, 20x26—100; flat, 26½x41 ins. Min. order, 5,000 lbs.

Whitaker Paper Co.	(India)	7.60c
	(Light green)	8.24c
	(Emerald)	8.64c
Virginia Paper Co.	(India)	7.60c
	(Light green)	8.15c
	(Emerald)	8.50c
Walker-Goulard-Plehn Co.		7.66c
Thomas Barrett & Sons		7.66c
Bulkley-Dunton & Co.		7.66c
Marquette Paper Co.		7.66c
Barton, Duer & Koch Paper Co.	(India)	7.53c
	(Light Green)	8.07c
	(Emerald)	8.42c
Butler Co.		7.66c

Machine-Finish Cover, White and Colored

No. 203—400,000 lbs., antique; white, dawn, quaker drab, robin's egg, terra totta, light blue, dark blue, buff, gold, cream, light gray, dark gray, light brown, dark brown, light green, dark green, sage, gobelin blue, and coral red; flat, 20x25—96, with projecting colored-paper marker between each 500 sheets. Min. order, one color 5,000 lbs.

Whitaker Paper Co.	7.49c
R. P. Andrews Paper Co.	7.03c
Cauthorne Paper Co., Inc.	7.43c
Stanford Paper Co.	7.37c
Marquette Paper Co.	7.11c
Barton, Duer & Koch Paper Co.	7.33c
Paper Corp. of U. S.	7.59c

No. 204—100,000 lbs., smooth; white, blue, brown, granite, green, pink tea and yellow, 20x26—100; flat cut 20x25 and 33x46 ins., with projecting colored-paper marker between each 500 sheets. Min. order, one color, 5,000 lbs.

Whitaker Paper Co.	7.49c
R. P. Andrews Paper Co.	7.07c
Cauthorne Paper Co., Inc.	7.43c
Stanford Paper Co.	7.37c
Marquette Paper Co.	7.11c
Barton, Duer & Koch Paper Co.	7.33c
Paper Corp. of U. S.	7.59c

50 Per Cent Rag Laid Cover, Colored

No. 205—120,000 lbs., blue, cream, white, gray and green, 20x26—130; flat, cut 20x25, 22x33, 26½x41, and 28x41 ins., with projecting colored-paper marker between each 500 sheets. Min. order, one color, 2,000 lbs.

Baxter Paper Co.	11.36c
Old Dominion Paper Co.	10.43c
R. P. Andrews Paper Co.	10.37c
Cauthorne Paper Co., Inc.	10.78c
Mathers-Lamm Paper Co.	10.84c
Paper Corp. of U. S.	11.45c
Lee Paper Co.	11.22c

Wood Manila

No. 209—350,000 lbs.. 24x36—80 to 120; flat, cut 21x32, 22½x34½, 25x38 and 32x36 ins., in wrapped bundles with projecting colored-paper marker between each 500 sheets.

Whitaker Paper Co.	4.45c
George W. Millar Co.	5.40c
Old Dominion Paper Co.	4.4849c
Perkins-Goodwin Co.	5.292c
Graham Paper Co.	5.29c
Mudge Paper Co.	5.35c
Cauthorne Paper Co.	4.45c
Bulkley-Dunton & Co.	5.40c
L. Hyman & Sons	5.40c
Stanford Paper Co.	5.40c
Barton, Duer & Koch Paper Co.	4.75c
Paper Corp. of U. S.	4.49c

No. 210—80,000 lbs., 24x36—80 to 120; rolls, 18 and 21 ins. wide (3-inch fiber cores).

Whitaker Paper Co.	4.24c
George W. Millar Co.	5.15c
Old Dominion Paper Co.	4.234c
Perkins-Goodwin Co.	5.047c
Graham Paper Co.	5.05c
Mudge Paper Co.	5.10c
Cauthorne Paper Co., Inc.	4.24c
Bulkley-Dunton & Co.	5.15c
L. Hyman & Sons	5.15c
Stanford Paper Co.	5.15c
Barton, Duer & Koch Paper Co.	4.50c
Paper Corp. of U. S.	4.30c

Chemical Wood Manila

No. 211—30,000 lbs., 24x36—100 to 160; flat, cut any size in wrapped bundles. Min. order, one weight, 5,000 lbs.

George W. Millar Co.	6.20c
Old Dominion Paper Co.	6.08c
Perkins-Goodwin Co.	6.076c
R. P. Andrews Paper Co.	5.90c
Bulkley-Dunton & Co.	6.20c
L. Hyman & Sons	6.20c
Stanford Paper Co.	6.20c
Paper Corp. of U. S.	5.80c

Rope Manila

No. 213—10,000 lbs., 24x36—120, 140 and 160; rolls, 18 and 48 ins. wide (3-inch fiber cores). Min. order, 5,000 lbs.

R. P. Andrews Paper Co.	18.00c

No. 214—25,000 lbs., 24x36—280; rolls, 48 ins. wide (3-inch fiber cores). Min. order, 5,000 lbs.

R. P. Andrews Paper Co.	17.00c

Drumhead Manila

No. 215—25,000 lbs., 24x36—280; flat, cut 20x30 and 26x42 ins. Min. order, 5,000 lbs.

Mudge Paper Co.	17.50c

No. 2 Kraft

No. 217—300,000 lbs., 24x36—83 to 166, flat, cut any size in wrapped bundles.

Old Dominion Paper Co.	4.924c
R. P. Andrews Paper Co.	4.38c
Mathers-Lamm Paper Co.	4.82c

No. 218—300,000 lbs., 24x36—83 to 166; cut any size, folded (25 sheets per fold), in wrapped bundles.

Old Dominion Paper Co.	4.924c
R. P. Andrews Paper Co.	4.38c
Mathers-Lamm Paper Co.	4.82c

No. 219—400,000 lbs., 24x36—83 to 166; rolls, 9, 10½, 11½, 24, 36, 39, and 48 ins. wide, wound on wooden plugs, 1½-inch hole, or on 3-inch fiber cores as may be specified.

Old Dominion Paper Co.	4.667c
R. P. Andrews Paper Co.	4.13c
Mathers-Lamm Paper Co.	4.58c

No. 1 Kraft

No. 220—5,000 lbs., 24x36—125 and 166; flat, cut any size in wrapped bundles.

Old Dominion Paper Co.	5.94c
Mathers-Lamm Paper Co.	6.37c
Paper Corp. of U. S.	6.25c

White Paraffin

No. 251—2,000 lbs., flat, 24x38—32. Min. order, 1,000 lbs.

Nashua Gummed & Coated Paper Co.	11.90c
Enterprise Paper Co.	12.24c
Mathers-Lamm Paper Co.	12.10c

White Gummed

No. 252—250,000 sheets, flat, 22x34 ins. Min. order, 25,000 sheets.

	Per M Sheets
Whitaker Paper Co.	$11.49
Nashua Gummed & Coated Paper Co.	6.00
Old Dominion Paper Co.	11.493
Mudge Paper Co.	12.03
Gummed Tape & Devices Co.	11.80
	13.00
R. P. Andrews Paper Co	12.47
Stanford Paper Co.	11.76
Mathers-Lamm Paper Co.	11.80
Barton, Duer & Koch Paper Co.	11.75

Blotting, White and Colored

No. 254—15,000 lbs., white, flat, 19x24—160, in wrapped bundles. Min. order, 4,000 lbs.

Whitaker Paper Co.	5.97c
Virginia Paper Co.	5.86c
Old Dominion Paper Co.	5.92c
Graham Paper Co.	5.25c
Mudge Paper Co.	5.88c
Enterprise Paper Co.	10.504c
R. P. Andrews Paper Co.	6.53c
Cauthorne Paper Co., Inc.	5.88c
Bulkley-Dunton & Co.	6.50c
L. Hyman & Sons	6.50c
Stanford Paper Co.	5.20c
Mathers-Lamm Paper Co.	5.84c
Barton, Duer & Koch Paper Co.	5.88c
Butler Co.	5.233c

No. 255—2,000 lbs., buff and salmon, flat, 19x24—160, in wrapped bundles. Min. order, 2,000 lbs.

Whitaker Paper Co.	6.72c
Virginia Paper Co.	6.35c
Old Dominion Paper Co.	6.34c
Graham Paper Co.	6.30c
Mudge Paper Co.	6.33c
Enterprise Paper Co.	10.511c
R. P. Andrews Paper Co.	6.71c
Cauthorne Paper Co., Inc.	6.34c
Bulkley-Dunton & Co.	6.50c
L. Hyman & Sons	6.50c
Stanford Paper Co.	6.25c
Mathers-Lamm Paper Co.	6.27c
Barton, Duer & Koch Paper Co.	6.35c
Butler Co.	6.2444c

25 Per Cent Rag Blotting, White and Colored

No. 256—20,000 lbs., white, flat, 19x24—160, in wrapped bundles. Min. order, 10,000 lbs.

Whitaker Paper Co.	6.94c
Virginia Paper Co.	6.86c
Old Dominion Paper Co.	6.933c
Graham Paper Co.	7.00c
Mudge Paper Co.	6.87c
Enterprise Paper Co.	12.928c
R. P. Andrews Paper Co.	7.07c
Cauthorne Paper Co., Inc.	6.83c
Bulkley-Dunton & Co.	9.00c
Stanford Paper Co.	6.95c
Mathers-Lamm Paper Co.	6.85c
Barton, Duer & Koch Paper Co.	6.89c
Butler Co.	7.00c

No. 257—10,000 lbs., buff and salmon, flat, 19x24—160, in wrapped bundles. Min. order, one color, 2,000 lbs.

Whitaker Paper Co.	7.44c
Virginia Paper Co.	7.36c
Old Dominion Paper Co.	7.443c
Graham Paper Co.	7.25c
Mudge Paper Co.	7.39c
Enterprise Paper Co.	12.933c
R. P. Andrews Paper Co.	7.43c
Cauthorne Paper Co., Inc.	7.33c
Bulkley-Dunton & Co.	9.00c
Stanford Paper Co.	7.20c
Mathers-Lamm Paper Co.	7.35c
Barton, Duer & Koch Paper Co.	7.43c
Butler Co.	7.2011c

Desk Blotting, Colored

No. 258—5,000 lbs., blue and buff flat, 19x24—200, in wrapped bundles. Min. order, one color, 5,000 lbs.

Whitaker Paper Co.	5.81c
Import Paper Co.	6.75c
Virginia Paper Co.	5.98c
Old Dominion Paper Co.	5.97c
Graham Paper Co.	6.35c
Mudge Paper Co.	5.94c
Enterprise Paper Co.	13.13c
R. P. Andrews Paper Co.	5.83c
Cauthorne Paper Co., Inc.	5.93c
Bulkley-Dunton & Co.	6.50c
L. Hyman & Sons	7.00c
Stanford Paper Co.	6.30c
Mathers-Lamm Paper Co.	5.91c
Barton, Duer & Koch Paper Co.	5.98c
Butler Co.	6.35c

No. 259—150,000 lbs. moss-green, flat, 19x24—200, in wrapped bundles. Min. order, 10,000 lbs.

Whitaker Paper Co.	5.34c
Import Paper Co.	6.75c
Virginia Paper Co.	5.53c
Old Dominion Paper Co.	5.589c
Graham Paper Co.	6.30c
Mudge Paper Co.	5.53c
Enterprise Paper Co.	13.499c
R. P. Andrews Paper Co.	5.33c
Cauthorne Paper Co., Inc.	5.498c
Bulkley-Dunton & Co.	6.75c
L. Hyman & Sons	6.75c
Stanford Paper Co.	6.25c
Mathers-Lamm Paper Co.	5.447c
Barton, Duer & Koch Paper Co.	5.54c
Butler Co.	5.30c

White Stereotype Molding

No. 260—1,500 lbs., 19x24—120; rolls, 24 ins. wide (3-inch fiber cores). Min. order, 1,000 lbs.

Graham Paper Co.	9.50c
Cauthorne Paper Co., Inc.	9.38c
Bulkley-Dunton & Co.	11.00c
Stanford Paper Co.	9.45c
Butler Co.	9.50c

Red Stereotype Molding

No. 261—1,000 lbs., 19x24—40; rolls,

24 in. wide (3-inch fiber cores). Min. order, 1,000 lbs.

Graham Paper Co.	10.50c
Cauthorne Paper Co., Inc.	13.90c
Bulkley-Dunton & Co.	11.00c
Stanford Paper Co.	10.45c
Butler Co.	10.50c

Oiled Manila Tympan

No. 262—30,000 lbs., 24x36—approximately 210; rolls, 38 and 48 ins. wide; 10-inch diameter; wound on wooden plugs, 1½-inch hole. Min. order, 5,000 lbs.

Cromwell Paper Co.	8.00c
Link Paper Co.	7.65c
George W. Millar Co.	8.45c
Old Dominion Paper Co.	8.279c
Perkins-Goodwin Co.	8.274c
R. P. Andrews Paper Co.	7.25c
Bulkley-Dunton & Co.	8.45c
L. Hyman & Sons	8.45c
Stanford Paper Co.	8.45c
Paper Corp. of U. S.	8.45c

Plate-Wiping, for Embossing Presses

No. 263—5,000 lbs., 24x36—100; rolls, 24 ins. wide (3-inch fiber cores). Min. order, 1,000 lbs.

R. P. Andrews Paper Co.	8.07c
Barton Duer & Koch Paper Co.	7.50c

Back-Lining for Case-Making Machines

No. 264—5,000 lbs., 24x36—180; rolls, 24 ins. diameter, 37 ins. wide (3-inch fiber cores). Min. order, 2,000 lbs.

Mathers-Lamm Paper Co.	4.45c
Barton Duer & Koch Paper Co.	4.24c

High-Finish Red Sulphite

No. 265—15,000 lbs., flat, 24x36—320 and 400, in wrapped bundles. Min. order, 5,000 lbs.

Whitaker Paper Co.	8.75c
Mudge Paper Co.	7.00c
Mathers-Lamm Paper Co.	7.47c

High-Finish Sulphite Manila Tag

No. 271—70,000 lbs., 24x36—160 to 280; flat, cut any size, min. width 24 ins., max, width 38 ins., in wrapped bundles.

George W. Millar Co.	6.00c
Old Dominion Paper Co.	5.898c
Perkins-Goodwin Co.	5.88c
Graham Paper Co.	5.88c
Mudge Paper Co.	5.95c
R. P. Andrews Paper Co.	5.90c
Bulkley-Dunton & Co.	6.00c
L. Hyman & Sons	6.00c
Stanford Paper Co.	6.00c
Barton, Duer & Koch Paper Co.	6.25c
Paper Corp. of U. S.	5.84c

Calendered Tag, Manila and Colored

No. 276—1,000,000 lbs., manila, 22½x28½—approximately 148; rolls, 23¼ and 26½ ins. wide (6-inch iron cores).

Barton, Duer & Koch Paper Co.	7.75c

No. 277—200,000 lbs., blue, brown, green, ivory, pink, red, salmon and yellow, 22½x28½—approximately 148; rolls 23¼ and 26½ ins. wide (6-inch iron cores). Min. order, one color, 10,000 lbs.

Barton, Duer & Koch Paper Co.	8.75c

Jute Tag

No. 280—150,000 lbs., 22½x28½—200 and 280; flat cut 22½x28½ ins., in wrapped bundles. Min. order, one weight, 10,000 lbs.

Whitaker Paper Co.	10.15c
Mudge Paper Co.	8.70c
Mathers-Lamm Paper Co.	8.60c

Manila Board

No. 281—40,000 lbs., 22½x28½—400; flat, cut 17x28, 21x32, and 22½x28½ ins., in wrapped bundles with projecting colored-paper marker between each 100 sheets. Min. order, 10,000 lbs.

Bartgis Bros. Co.	4.375c
George W. Millar Co.	5.35c
Old Dominion Paper Co.	5.249c
Perkins-Goodwin Co.	5.243c
Graham Paper Co.	5.24c
Mudge Paper Co.	5.30c
Bulkley-Dunton & Co.	5.35c
L. Hyman & Sons	5.35c
Stanford Paper Co.	5.35c
Paper Corp. of U. S.	4.87c

Railroad Board, White and Colored

No. 302—50,000 sheets, white, flat, 22x28 ins., 4-ply, each 100 sheets fully banded, packed in wooden cases. Min. order, 10,000 sheets.

	Per M Sheets
Whitaker Paper Co.	$22.95
Old Dominion Paper Co.	22.74
R. P. Andrews Paper Co.	22.83
Stanford Paper Co.	22.90
Barton, Duer & Koch Paper Co.	22.89
Paper Corp. of U. S.	22.99

No. 303—30,000 sheets, white, flat, 22x28 ins., 8-ply, each 100 sheets fully banded, packed in wooden cases. Min. order, 5,000 sheets.

	Per M Sheets
Whitaker Paper Co.	$32.85
Old Dominion Paper Co.	33.47
R. P. Andrews Paper Co.	33.57
Stanford Paper Co.	33.65
Barton, Duer & Koch Paper Co.	33.64
Paper Corp. of U. S.	33.19

No. 304—30,000 sheets, white, flat, 22x28 ins., 14-ply, each 50 sheets fully banded, packed in wooden cases. Min. order, 5,000 sheets.

	Per M Sheets
Whitaker Paper Co.	$46.80
Old Dominion Paper Co.	45.14
R. P. Andrews Paper Co.	45.33
Stanford Paper Co.	45.39
Barton, Duer & Koch Paper Co.	45.40
Paper Corp. of U. S.	45.19

No. 305—30,000 sheets, ash gray, blue, buff, green, lemon and orange, flat 22x28 ins., 4-ply, each 100 sheets fully banded, packed in wooden cases. Min. order, one color, 5,000 sheets.

	Per M Sheets
Old Dominion Paper Co.	$29.33
R. P. Andrews Paper Co.	29.43
Stanford Paper Co.	29.49
Barton, Duer & Koch Paper Co.	29.50
Paper Corp. of U. S.	29.04

Wood Bristol, Colored

No. 306—150,000 lbs., buff 22½x28½—150; rolls, 22 ins. wide (6-inch iron cores).

Old Dominion Paper Co.	4.734c
Barton, Duer & Koch Paper Co.	4.65c

No. 307—80,000 lbs. blue, buff, gray, green, mellon, pink, quaker-drab and yellow, flat, 21x31—204; in wrapped bundles with projecting colored-paper marker between each 100 sheets.

Old Dominion Paper Co.	5.614c
Barton, Duer & Koch Paper Co.	5.25c

No. 308—50,000 lbs., blue, brown, buff, gray, green, melon, pink and yellow, 22½x28½—200; rolls, 20 ins. wide (6-in. iron cores).

Old Dominion Paper Co.	4.984c
Barton, Duer & Koch Paper Co.	5.00c

No. 309—50,000 lbs., blue, brown, buff, gray, green, melon, pink and yellow, 22½x28½—200; rolls, 20 ins. wide (6-inch iron cores).

Old Dominion Paper Co.	4.984c
Barton, Duer & Koch Paper Co.	5.00c

No. 310—60,000 lbs., buff, 22½x28½—200; flat, cut 12x18 and 14½x17½ ins., the grain to run lengthwise of the sheet, in wrapped bundles with projecting colored-paper marker between each 100 sheets.

Old Dominion Paper Co.	5.224c
Barton, Duer & Koch Paper Co.	5.00c

United States Postal Card Bristol

No. 325—3,000,000 lbs., 22½x28½—188; rolls, 33 ins. wide and 36 ins. in diameter (6-inch iron cores).

Whitaker Paper Co.	(1000 tons)	4.64c
	(500 tons)	4.80c
R. P. Andrews Paper Co.	(500 tons)	4.69c
	(250 tons)	4.79c

No. 326—3,000,000 lbs., 22½x28½—188; rolls, 33 ins. wide and 36 inch in diameter (6-inch iron cores).

Whitaker Paper Co.	4.83c
R. P. Andrews Paper Co.	4.69c
Barton, Duer & Koch Paper Co.	4.71c

Pressboard, Colored

No. 351—30,000 sheets, red, flat, 24x32 ins., thickness .0140 inch. Min. order, 5,000 sheets.

	Per C Sheets
Walker-Goulard-Plehn Co.	$17.50
R. P. Andrews Paper Co.	6.67
Barton, Duer & Koch Paper Co.	6.50

No. 352—10,000 sheets, gray, flat, 30x36 ins., thickness .0300 inch. Min. order, 5,000 sheets.

	per C sheets
Old Dominion Paper Co.	$18.64
R. P. Andrews Paper Co.	21.36
Resolute Paper Products Co.	18.48
Barton, Duer & Koch Paper Co.	19.10

News Board

No. 360—7,000 lbs., flat, 26x38 ins., No. 100 (to be trimmed square on four sides). Min. order, 1,000 lbs.

Whitaker Paper Co.	2.20c
Bartgis Bros. Co.	2.125c
Virginia Paper Co.	2.25c
Old Dominion Paper Co.	2.42c
Walker-Goulard-Plehn Co.	2.145c
Container Corp. of America	1.90c
Mudge Paper Co.	2.25c
Enterprise Paper Co.	2.205c
R. P. Andrews Paper Co.	2.23c
Resolute Paper Prods. Co.	2.50c
Stanford Paper Co.	2.25c
Barton, Duer & Koch Paper Co.	2.20c

Chip Board

No. 361—1,500,000 lbs., 26x38 ins., No. 50, flat; cut 21½x32½, 24½x38, 26x38, 28½x34½, 32½x42½ and 34x44.

Whitaker Paper Co.	1.66c
Bartgis Bros. Co.	1.75c
George W. Millar Co.	2.00c
Virginia Paper Co.	1.675c
Old Dominion Paper Co.	1.9279c
Walker-Goulard-Plehn Co.	1.995c
Paper Sales Agency Co.	1.998c
Container Corp. of America	1.625c
Mudge Paper Co.	1.6788c
Enterprise Paper Co.	1.69745c
R. P. Andrews Paper Co.	1.69c
Cauthorne Paper Co., Inc. (375 tons)	1.957c
(balance)	2.197c
Resolute Paper Prods. Co.	1.715c
Bulkley-Dunton & Co.	2.00c
Stanford Paper Co.	1.715c
Mathers-Lamm Paper Co. (500,000 lbs. 1st quarter)	1.95c
(500,000 lbs. 2nd quarter)	2.20c
Barton, Duer & Koch Paper Co.	1,678c

Marble Grained Lined Board

No. 362—20,000 lbs., 26x38 ins., No. 50; flat, cut 22x32 ins.

Old Dominion Paper Co.	5.989c
Butterfield-Barry Co.	5.70c
Mathers-Lamm Paper Co.	4.80c
Paper Corp. of U. S.	6.12c

Strawboard

No. 363—7,000 lbs., flat, 26x38 ins., No. 50.

George W. Millar Co.	3.75c
Mathers-Lamm Paper Co.	5.17c

Lined Chip Board

No. 364—5,000 lbs., flat, 26x38 ins., No. 50.

Whitaker Paper Co.	2.20c
George W. Millar Co.	2.375c
Virginia Paper Co.	2.25c
Old Dominion Paper Co.	2.42c

Walker-Goulard-Plehn Co.	2.745c
Mudge Paper Co.	2.25c
Enterprise Paper Co.	2.2055c
R. P. Andrews Paper Co.	2.23c
Cauthorne Paper Co.	2.48c
Resolute Paper Prods. Co.	2.50c
Stanford Paper Co.	2.25c
Barton, Duer & Koch Paper Co...	2.20c

Lined Box Board

No. 365—36,000 lbs., 26x38 ins., No. 40; flat, cut 24½x34 ins. Min. order, 36,000 lbs.

Whitaker Paper Co.	2.158c
Virginia Paper Co.	2.20c
Old Dominion Paper Co.	2.409c
Walker-Goulard-Plehn Co.	2.745c
Mudge Paper Co.	2.1585c
Enterprise Paper Co.	2.20495c
R. P. Andrews Paper Co.	2.23c
Cauthorne Paper Co., Inc.	2.48c
Resolute Paper Products Co.	2.2275c
Bulkley-Dunton & Co.	2.50c
Stanford Paper Co.	2.25c
Barton, Duer & Koch Paper Co..	2.14c

Binder's Board, No. 1 Quality

No. 366—300,000 lbs., flat, to trim 25x30 ins., Nos. 16, 18, 20, 25, 30 and 40.

Consolidated Paper Co.	3.675c
R. P. Andrews Paper Co.	3.85c
Mathers-Lamm Paper Co.	3.5825c
Barton, Duer & Koch Paper Co...	3.70c

No. 367—100,000 lbs., 25¼x30¾ ins., Nos. 12 and 20; flat, to trim 34x44 ins.

Consolidated Paper Co.	3.875c
R. P. Andrews Paper Co.	3.85c
Barton, Duer & Koch Paper Co...	3.70c

Binder's Board, Best Quality

No. 368—100,000 lbs., flat, to trim 20x30 ins., and 22x28 ins., Nos. 18, 20, 25, 30, 35, 40 and 45. Min. order, 5,000 lbs.

Consolidated Paper Co.. (carloads)	5.05c
(less than carloads)	5.12c
R. P. Andrews Paper Co.	5.19c
Barton, Duer & Koch Paper Co...	5.75c

Paper Mill Machinery Production

Manufacturers of paper-mill, pulp-mill, and paper-container machinery reported decreases in employment, wages, and production for 1939 as compared with 1937, according to preliminary figures compiled from returns of the Census of Manufactures for 1939 and released today by Director William Lane Austin, Bureau of the Census, Department of Commerce.

TABLE 1.—SUMMARY FOR THE INDUSTRY: 1939 AND 1937
(Because they account for a negligible portion of the national output, plants with annual production valued at less than $5,000 have been excluded since 1919)

	1939	1937	Per cent of decrease (—)
Number of establishments	99	91	(*)
Salaried personnel [1]	1,206	1,398	—13.7
Salaries [1, 2]	$2,437,694	$4,570,561	—46.7
Wage earners (average for the year) [2, 3]	5,409	6,813	—20.6
Wages [2, 3]	$7,775,242	$10,861,258	—28.4
Cost of materials, supplies, fuel, purchased electric energy, and contract work [2]	$12,727,445	$19,015,419	—33.1
Value of products [2]	$32,419,924	$43,406,178	—25.3
Value added by manufacture [4]	$19,692,479	$24,390,759	—19.3

* Per cent not computed where base is less than 100.
[1] No data for employees of central administrative offices are included.
[2] Profits or losses cannot be calculated from the census figures because no data are collected for certain expense items, such as interest, rent, depreciation, taxes, insurance, and advertising.
[3] The item for wage earners is an average of the numbers reported for the several months of the year and includes both full-time and part-time workers. The quotient obtained by dividing the amount of wages by the average number of wage earners should not, therefore, be accepted as representing the average wage received by full-time wage earners.
[4] Value of products less cost of materials, supplies, fuel, purchased electric energy, and contract work.

TABLE 2.—PRODUCTS, BY CLASS, NUMBER, AND VALUE: 1939 AND 1937

	1939	1937
1. "Paper-Mill, Pulp-Mill, and Paper-Products Machinery" industry, all products, total value	$32,419,924	$43,406,178
2. Paper-mill, pulp-mill, and paper-container machinery, parts and attachments, made in this industry	29,453,850	38,451,577
3. Miscellaneous products not specified	11,305	3,824,194
4. Other products (not classified in this industry) [1]	2,362,289	
5. Receipts for contract and repair work	592,480	1,130,407
6. Paper-mill and pulp-mill machinery, etc. made as secondary products in other industries [2]	402,658	2,889,371
Paper-mill, pulp-mill, and paper-container machinery, parts and attachments, aggregate value (sum of 2 and 6)	$29,856,508	$41,340,948
Paper-container machines:		
Bag-making and envelope-making, value	$ 1,263,782	$ 1,386,639
Box making:		
Number reported:		
Number	1,553	
Value	$ 3,289,461	
Number not reported, value	$ 1,820,988	(3)
Other:		$ 5,888,093
Number reported:		
Number	456	
Value	$ 177,718	
Number not reported, value	$ 428,534	
Paper-mill and pulp-mill machinery	$20,476,389	$33,176,585
Parts and attachments	$ 2,399,636	$ 889,631

[1] Chiefly packaging and wrapping machines, transmissions, castings, rubber-working machinery, and sawmill machinery.
[2] Data incomplete; complete figure will ge given in final report.
[3] No data.

This industry, as constituted for census purposes, embraces establishments primarily engaged in the manufacture of paper-pulp, paper, and paper-container machinery.

The wage earners primarily engaged in manufacturing employed in this industry in 1939, were 5,409, a decrease of 20.6 percent compared with 6,813 reported for 1937, and their wages, $7,775,242, were less than the 1937 figure, $10,861,258, by 28.4 percent. These decreases may be partially accounted for by the fact that the 1939 Census of Manufactures questionnaire, for the first time, called for personnel employed in distribution, construction, etc., separately from the manufacturing employees of the plants. It is not known how many of the wage earners reported for 1937 were engaged in distribution and construction and how many were engaged in manufacturing. Employees of the plants reported as engaged in distribution and construction activities in 1939 are not included in this preliminary report but will be included in the final report.

The value of products of the industry for 1939 amounted to $32,419,924, which is a decrease of 25.3 per cent compared with the $43,406,178 reported for 1937.

Summary statistics for 1939 and 1937 are given in Table 1. Detailed statistics on production are given in Table 2. All figures for 1939 are preliminary and subject to revision.

Tileston & Hollingsworth Exhibit

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., November 25, 1940—Tileston & Hollingsworth Company was one of the exhibitors in connection with the celebration of the 500th Anniversary of Printing sponsored by the Graphic Arts Institute, Howard Patterson, secretary, held at the Hotel Statler, November 22-23.

The company demonstrated the process of making paper by hand as it was done before the advent of machines. The exhibit consisted of a vat containing raw stock from the Tileston & Hollingsworth Company's Hyde Park, Mass., mill. A. V. Howland, vice-president of the company, brought the vat, screens and press from England, where some paper is still made by hand today. The screens were used in the manufacture of paper at the exhibit, dipped in the pulp solution in the vat. The wet sheet of paper was transferred to a felt. Layers of alternate felt and paper were placed in the press where they remained for several hours and were then hung up to dry. Most of the Tileston & Hollingsworth sales force were in attendance at the show.

Census of Envelopes

Manufacturers of envelopes reported slightly decreased activities in 1939 as compared with 1937, according to preliminary figures compiled from returns of the Census of Manufactures for 1939 and released last week by Director William Lane Austin, Bureau of the Census, Department of Commerce.

This industry, as constituted for census purposes, embraces establishments engaged primarily in the manufacture of paper envelopes of any description, including those made for filing, wrapping, etc.

The wage earners primarily engaged in manufacturing employed in this industry in 1939 were 8,689, a decrease of 8.6 per cent compared with 9,511 reported for 1937, and their wages, $9,596,844, were less than the 1937 figure, $10,502,815, by 8.6 per cent. These decreases may be partially accounted for by the fact that the 1939 Census of Manufactures questionnaire, for the first time, called for personnel employed in distribution, construction, etc., separately from the manufacturing employees of the plants. It is not known how many of the wage earners reported for 1937 were engaged in distribution and construction and how many were engaged in manufacturing. Employees of the plants reported as engaged in distribution and construction activities in 1939 are not included in this preliminary report but will be included in the final report.

The value of products of this industry for 1939 amounted to $50,118,134, a decrease of 2.3 per cent as compared with $51,289,922 reported for 1937.

Summary statistics for the industry for 1939 and 1937 are given in Table 1, and production statistics are given in Table 2. All figures for 1939 are preliminary and subject to revision.

TABLE I.—SUMMARY FOR THE INDUSTRY: 1939 AND 1937

(Because they account for a negligible portion of the national output, plants with annual production valued at less than $5,000 have been excluded since 1919)

	1939	1937	Per cent of increase or decrease (—)
Number of establishments	169	162	4.3
Salaried personnel [1]	1,083	1,691	—36.0
Salaries [1, 2]	$3,398,231	$4,263,973	—20.3
Wage earners (average for the year) [3]	8,689	9,511	— 8.6
Wages [2, 3]	$9,596,844	$10,502,815	— 8.6
Cost of materials, supplies, fuel, purchased electric energy, and contract work [2]	$24,623,014	$25,106,584	— 1.9
Value of products [2]	$50,118,134	$51,289,922	— 2.3
Value added by manufacture [4]	$25,495,120	$26,183,338	— 2.6

[1] No data for employees of central administrative offices are included.
[2] Profits or losses cannot be calculated from the census figures because no data are collected for certain expense items, such as interest, rent, depreciation, taxes, insurance, and advertising.
[3] The item for wage earners is an average of the numbers reported for the several months of the year and includes both full-time and part-time workers. The quotient obtained by dividing the amount of wages by the average number of wage earners should not, therefore, be accepted as representing the average wage received by full-time wage earners.
[4] Value of products less cost of materials, supplies, fuel, purchased electic energy, and contract work.

TABLE II.—PRODUCTS, BY KIND AND VALUE: 1939 AND 1937

	1939	1937
1. Envelopes industry, all products, total value	$50,118,134	$51,289,922
2. Envelopes made in this industry	47,337,347	46,265,140
3. Other products not classified in this industry	[1] 2,619,623	4,664,628
4. Receipts for custom work	161,164	360,154
5. Envelopes made as secondary products in other industries	[2] 479,514	2,258,653
Envelopes, aggregate value (sum of 2 and 5)	[2] $47,816,861	$48,523,793

[1] Principally other converted paper products, such as bags, tablets, cups, tags, and boxes.
[2] Incomplete; complete figure will be shown in final report.

Welding Group Addressed by Dr. Mudge

"Nickel and High-Nickel Non-Ferrous Alloys—Their Manufacture, Fabrication, Properties and Uses in Welded Structures" was the subject of an address presented by Dr. William A. Mudge, metallurgist of The International Nickel Company, Inc., before the Pittsburgh Section of the American Welding Society, on Wednesday evening, November 13, at Pittsburgh, Pa. His address was made at the Mellon Institute of Industrial Research at 8:00 P. M., following a dinner of the Section at the Webster Hall Hotel.

Dr. Mudge, who is assistant director of the Technical Service Section of International Nickel's Development and Research Division, first described the position of nickel in the metallurgical industry. He then discussed nickel alloys, placing special emphasis on non-ferrous nickel alloys. The film "Nickel High-Lights," depicting manufacture, will then be shown, after which the speaker will discuss the properties and uses of nickel alloys, particularly on welded structures.

Following Dr. Mudge's address, F. G. Flocke, also with the Nickel Company's Development and Research Division, talked briefly on "Practical Aspects of Welding Monel, Nickel and Inconel." He also discussed methods of welding Ni-clad, Monel-clad and Inconel-clad steels.

How to Eliminate Dirt Hazards

A new 4 page illustrated folder titled "Dirt Is A Critical Hazard" and describing the application, operation, and dirt removing qualities of the Precipitron electrostatic air cleaner is announced by the Westinghouse Electric & Manufacturing Company.

This attractive and informative folder tells briefly the complete story of the Precipitron and how it removes harmful dirt from the air. Successive paragraphs tell what the electrostatic cleaner is, how it operates, and why its efficiency is higher than any other air cleaner. Sketches and other illustrations aid the reader throughout the explanations.

Places and industries where air cleaning can save money or valuable merchandise are listed. Installation and cleaning capacities are briefly covered, with a cutaway picture of a typical Precipitron installation included.

Last page of the folder contains a list of successful Precipitron installations in various industrial business and commercial locations. Capacities of these installations are listed to give those interested a general idea of the extent of air cleaning necessary.

Copies of the folder F-8501 may be obtained upon request from the Precipitron Department, of the Westinghouse Electric and Manufacturing Company, Edgewater Park, Cleveland, Ohio.

Arthur Herman Goes with W. J. Green Co.

Arthur Herman, who for the past 20 years has been prominently identified with the wood pulp and paper mill supplies trade, is now associated with the W. J. Green Company, Inc., of 175 Fifth avenue, New York, it was announced this week. Mr. Herman will devote his activities to the sale of wood pulp and other paper-making materials dealt in by the Green Company.

TAPPI Notes

The New England Section of the Technical Association of the Pulp and Paper Industry will meet at the Roger Smith Hotel, Friday, December 13 at 6:30 p.m. J. P. Strasser of the Stein, Hall Mfg. Company, Chicago will talk on "Starches".

Paul Torre, formerly of the A. E. Staley Company, is now with the Durez Plastics and Chemicals Company, Tonawanda, N. Y.

S. G. Blankinship, formerly of the Brown Company, is now with the Port Royal Sales Company, New York, N. Y.

A. S. Cosler is now with the Groveton Paper Company, Groveton, N. H.

R. I. Wynn-Roberts, formerly with the Noble & Wood Machine Company, is now with the Finch, Pruyn Company, Glens Falls, N. Y.

The Ecusta Paper Company, Brevard, N. C. is now a corporate member of the Technical Association.

C. M. Connor of the Valley Forge Laboratories, West Conshohocken, Pa. would like to obtain the following back numbers of the Paper Trade Journal: July 7, 14, Aug. 25, Sept. 1, 15, Dec. 22, 1932; April 18, 1935 and Oct. 1, 1936.

Change in Tappi Standard

In TAPPI Standard T 415 m-40, Casein in Paper (Qualitative), the coloration produced by the test occurs in the coagulated casein rather than in the supernatent liquid. To clarify the method, therefore, the Paper Testing Committee has revised the method by changing the last sentence to read: "On heating, the presence of casein is indicated by the development of a red coloration of the coagulated casein".

New Baker Hy-Lift Truck

The latest addition to the line of industrial trucks manufactured by the Baker Industrial Truck Division of The Baker-Raulang Company, Cleveland, is its new Type H-2 Series F Hy-Lift Truck which is available in 4000-lb. capacity. This new model has been designed for operation in narrow aisles and congested areas, and has the following features: Efficient hydraulic lift; lighter weight without sacrifice of strength or ruggedness; shorter overall length; accessibility—all controls and hoists come grouped in convenient control panel; absolute control of hoisting and lowering speeds.

Lifting is accomplished by a hydraulic system incorporating the latest developments in this type of equipment consisting of a gear pump driven by its own motor and connected to the lifting cylinder through suitable control and release valves. The control valves are of the metering type permitting absolute control of the speed at all times.

The standard simple lift is 60 inches. The standard telescoping lift is 119 inches.

This new model should be very attractive to purchasers because of its ability to operate in aisles 61 inches wide.

R. H. Brady Goes to Whiting-Plover Co.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., November 25, 1940—Richard H. Brady of Milwaukee, Wis., has accepted a position as advertising manager of the Whiting-Plover Paper Company, Stevens Point, Wis. He began his new duties last week. Mr. Brady formerly was associated with the Perfect Corporation of Milwaukee.

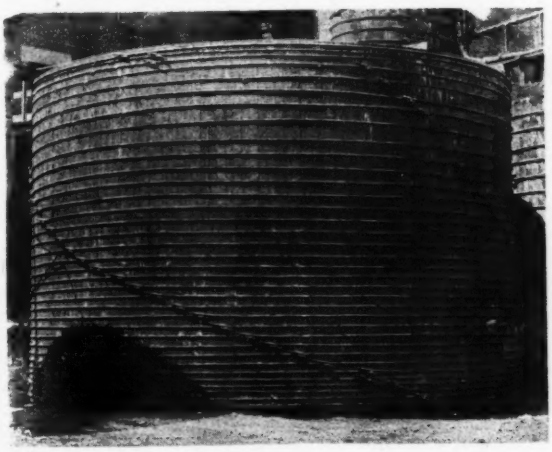
FOR OVER HALF A CENTURY . . . . .

KALAMAZOO HAS SPECIALIZED IN PAPER MILL TANKS

As a pioneer in paper mill tanks, we developed the Glazed Tile Tank which has received almost universal acceptance. More than 1,000 successful installations stand as proof of their cleanliness, long life and economy.

Here are shown three of approximately thirty tile tanks at the Kalamazoo Vegetable Parchment Company.

WOOD TANKS, ACID TANKS, BLOW PITS



If you have a tank problem, why not let the long experience of our engineering staff guide you to the right answer.

Kalamazoo

TANK AND SILO COMPANY

KALAMAZOO, MICHIGAN

Established 1867

New TAPPI Members

The executive committee of the Technical Association of the Pulp and Paper Industry has elected the following to membership:

Earl F. Anderton, development engineer, Scott Paper Company, Chester, Pa., has been transferred from the associate to the active grade.

George W. Brumley, assistant to the chief chemist, St. Joe Paper Company, Port St. Joe, Fla., is a 1934 graduate of the University of Florida and was formerly with the Container Corporation of America, Fernandina, Fla.

Charles S. Collins, color chemist Hollingsworth & Whitney Company, Waterville, Me., is a 1926 graduate of the University of Maine and was formerly with S. D. Warren Company, Cumberland Mills, Me. and Waterfalls Paper Mills, Mechanic Falls, Me.

John D. Davis, technical director, Dill & Collins, Inc., Philadelphia, Pa., has been transferred from the associate to the active grade.

Karl E. Foster, chemist, Fairfield Paper Company, Baltimore, Ohio, is a 1936 graduate of Denison University.

Crawford H. Graham, sales engineer, The Foxboro Company, Portland, Oregon, graduated from Oregon State College in 1936.

James A. Hoerner, engineer, Champion Paper and Fibre Company, Hamilton, Ohio, is a 1936 graduate of the University of Cincinnati in mechanical engineering.

George R. Lewers, chief designing engineer, Underpinning and Foundation Company, New York, N. Y., is a 1913 graduate of both Stevens and Pratt Institutes of Technology and was formerly with General Chemical Company and Research Corporation, New York, N. Y.

J. McK. Limerick, chief chemist, Bathurst Power & Paper Co., Bathurst, N. B., graduated from the University of New Brunswick in 1931 and his master's degree from McGill University in 1933 and was formerly with the Restigouche Company, Campbellton, N. B.

Robert D. McCarron, technical service department, Stein, Hall & Co., Inc., New York, N. Y., has been transferred from the associate to the active grade.

Max R. Oberdorfer, assistant engineer, St. Helens Pulp and Paper Company, St. Helens, Ore., is a 1936 graduate of the University of Washington and was formerly with Southern Kraft Corp., Springhill, La. and Crown Zellerbach Corporation, Camas, Wash.

Eugene E. Rodabaugh, pulp tester, Champion Paper and Fibre Company, Hamilton, Ohio, is a 1940 graduate of the New York State College of Forestry.

Allan G. Strang, chief chemist, Puget Sound Pulp and Timber Company, Anacortes, Wash., is a 1937 graduate of the University of Washington and was formerly with the Inland Empire Paper Company, Millwood, Wash.

Frederick Streicher, superintendent of supplies, Dill & Collins, Inc., Philadelphia, Pa., has been transferred from the associate to the active grade.

Barry M. Turner, power superintendent, International Paper Company, Ticonderoga, N. Y., is a 1927 graduate of Georgia School of Technology.

George R. Wallace, president and treasurer, Fitchburg Paper Company, Fitchburg, Mass., is a 1913 graduate of Massachusetts Institute of Technology.

Edgar L. Wiberg, assistant chemist, Central Paper Company, Muskegon, Mich., is a 1940 graduate of the University of Wisconsin and was formerly with the Gilbert Paper Company, Menasha, Wis.

Pulp Discussed at Salesmen's Luncheon

In discussing the pulp situation at the Monday luncheon meeting of the Salesmen's Association of the Paper Industry held at the Hotel Lexington, New York on November 18, Oliver M. Porter, secretary of the U. S. Pulp Producers Association was the principal speaker and said in part:

Before the War, the United States imported about two million tons of pulp a year (all grades)—six hundred thousand tons from Canada and almost a million and a half from Europe. Present imports of European pulp are at the rate of not more than 25,000 tons a year, and are not likely to be increased as long as the fighting continues in Europe. Imports of Canadian pulp have been increased from a pre-war monthly average of 50,000 tons to 70,000 and probably could be still further increased somewhat, if necessary.

Exports of pulp from the United States during the past three years have averaged only about 200,000 tons a year. More than double that amount will be exported this year. Next year: 300,000; 400,000—who knows? Except for the United Kingdom, the European market appears to be definitely lost to North American mills. These changes in imports and exports still leave a gap in American pulp supply of at least a million and a half tons. That this gap will be more than filled is evident from the figures of current domestic production. So far this year the output of United States pulp mills has been at the rate of 8¾ million tons, as contrasted with a 6½ million ton average during the past three years. The net result, expressed in terms of apparent total pulp supplies, all grades, (production plus imports minus exports) looks to be about as follows: 1939, 9,000,000 tons; 1940, 9,650,000 tons; 1941, 10,150,000 tons.

1941 prospects are quite different, however, when confined to pulp available "for the market"—i.e. when based on estimated imports and domestic sales—although present figures as to 1941 can be little more than guesses:

1939, 2,900,000 tons; 1940, 2,300,000 tons; 1941, 2,000,000 tons.

The situation as regards specific grades may also be quite different from the pattern of these "over-all" supplies. Furthermore, mills which normally depend upon Europe for a large part of their pulp supply will go into 1941 with very much reduced inventories of purchased pulp—perhaps as much as 400,000 tons, all grades.

According to A.P.&P.A. figures, U. S. paper mills are now operating at 89 per cent of capacity. Sooner or later, of course, our defense spending will result in increased paper consumption and commensurate increases in demand for pulp. We believe that the domestic pulp industry can meet that demand, as far as over-all supplies are concerned, but that the volume of pulp for sale will be less adequate, particularly in the unbleached grades. We also believe that any present temporary increases in domestic stocks can be considered only as a reasonable reserve in the light of anticipated increased "market" demand for pulp in 1941.

Holiday Slows Demand

[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Ind., November 25, 1940—The holiday last week cut into paper demand rather seriously, according to all reports, but the general undertone of the market is good and from now until Christmas business should improve and all indications point to a better holiday trade than last year.

Most of the paper box and board factories shut down over the holiday period, but will resume operations today. Many of them are working two shifts and warehouse stocks are not heavy. Most of the box buying for Christmas has been completed, but some belated orders yet are being received. A considerable increase in demand has been noted from the automobile accessory and hardware trades during the last two weeks.

A fair demand for wrapping paper and bags was seen last week, but the vacation period served to cut short the volume. Economic conditions in this territory are much better than they were a year ago and demand for these items from retailers is expected to jump this week and maintain a high level until Christmas at least.

In spite of unfavorable weather conditions, coupled with the lateness of the season, demand for building paper and roofing continues good and all signs point to a steady demand during most of the winter unless weather conditions become so severe as to halt all construction. The volume sold this year will be by far the highest since 1929. Dealers now are buying strictly from hand to mouth and will continue this policy until inventory period at least.

Newsprint demand, while slow last week, should improve this week and continues good until the first of the year. Lineage is about level with a year ago and such increases as have been noted seem to come from domestic advertisers. No change in price has been noted.

Fine paper demand showed little change last week, with prices firm and the general situation favorable.

No change was seen in the waste paper or rag market.

Three thousand pounds of Sitka spruce seeds have been ordered by the British forestry commission from British Columbia, and will be used for reforestation of denuded forest areas in Britain, it was announced recently by the provincial forestry service.

THIS dial says "When" *automatically!* It has photo-electric control and weighs accurately (and rapidly) batch ingredients of varying kinds and quantities.

Perhaps you don't do batching or proportioning. Even so, the *basic principle* of this versatile control device may help you solve some other weighing or force measuring problem. Remember, it is accurate, rapid and automatic. It saves time and cuts costs.

And it's Toledo-built; more evidence of Toledo's superior engineering knowledge and versatility. It is another of the "45,000 Ways to Weigh"—and that's the title of a new illustrated brochure that you will find interesting, helpful, and time-saving. Send for it.

TOLEDO SCALE COMPANY, Industrial Scale Division, TOLEDO, OHIO

181 Sales and Service Offices in U. S. and Canada.

Investigate Timber Methods

[FROM OUR REGULAR CORRESPONDENT]

VANCOUVER, Mass., November 18, 1940—McNally & Robinson, officials of the Anglo-Canadian Pulp and Paper Company of Quebec, have recently been spending some time on Vancouver Island investigating economical methods of handling timber. They visited operations of the Alberni Pacific Lumber Company at Franklin River and at Camp One and also Bloedel, Stewart and Welch operations as well as those of the International Timber Company at Youbou. Before leaving Vancouver Island they also plan to inspect the show of the Comox Logging Company near Ladysmith.

Obituary

Dr. Thomas S. Southworth

Dr. Thomas Shephard Southworth of New York City, who was president of the Southworth Company of West Springfield, Mass., until two years ago, died November 15 in New York. He was 79. The funeral was held at the First Congregational Church, West Springfield, Sunday and burial was in White Church Cemetery, West Springfield.

Dr. Southworth was born in West Springfield, June 7, 1861, the son of Edward and Mary Woodbury Southworth. He was graduated from Yale College in 1883 and from Columbia Medical School in 1887. He practiced medicine in New York from 1887 until 1921, when he retired and acquired a widespread reputation as a children's specialist. He was a well-known contributor to medical journals on pediatrics.

He leaves one son, Dr. Hamilton Southworth, of New York, and two nephews, Melvin Southworth, president of the Southworth Company and Edward Southworth, secretary-treasurer of the company.

Robert M. Reeder

Robert Malone Reeder, 42, former secretary and treasurer of the Tayloe Paper Company, Tulsa, Okla., died November 15 in a Tulsa hospital following a four-year illness.

Mr. Reeder came to Tulsa in 1922 from Memphis, Tenn., to take the secretary-treasurer post, which he held until his health failed. He was born in Florence, Ala.

Mr. Reeder was a steward at the Boston Avenue Methodist church, and was active in boy scout work. He was also a member of the Cooperative club.

Surviving are the widow, Mrs. Christy Canada Reeder of the home, 1916 E. Seventeenth pl.; a son, Robert, 13, a student at Woodrow Wilson junior high school and also of the home, and two sisters, Mrs. G. C. Cash and Mrs. Paul Kimbrough, both of Florence.

Funeral services will be held Saturday at 9 a. m. in the Rose chapel at Boston Avenue Methodist church. Interment will be in Florence Monday morning. Arrangements were made by the Mowbray Manning funeral home.

John Robert Garnaus

John Robert Garnaus, secretary of the Geigy Company, Inc., died November 17, after an illness of almost four and a half years.

Mr. Garnaus spent his entire career in the dyestuff business, apprenticing himself in 1914 with J. R. Geigy, S. A. in Basle, Switzerland, which training was interrupted by service with the U. S. Diplomatic Corps in Switzerland and France, and upon the entry of the United States in the World War, he enlisted and performed outstanding service in the Intelligence Corps of the A.E.F. in France and Germany.

In 1919 he returned to the United States and to the Geigy organization in New York where he was made assistant to the director of sales and in February, 1933 he succeeded William F. Kip as director and secretary of the company, the position occupied by Mr. Garnaus' father until his death in 1909.

Mr. Garnaus was born in Brooklyn in 1896, the son of John C. and Annie Buechner Garnaus and was educated at Poly Prep Grammar School and Manual Training High School. Aside from the period spent in Europe, he lived his entire life in Brooklyn where he was interested in charities and in particular the Colony House which he served on the Men's Council.

Surviving are his wife, Beatrice Scarborough Garnaus, a daughter Nancy, his mother, a sister Anita, and two brothers, Harry and Edward.

Wesley W. Binford

[FROM OUR REGULAR CORRESPONDENT]

Wesley W. Binford, 58, formerly manager of the twine department of the Andrews Paper Company, Boston, who lived at 51 Strathmore road, Brookline, Mass., died November 17 at the Rhode Island Hospital, Providence, after a long illness.

Mr. Binford was born in Medford, Mass., and before moving to Brookline 14 years ago had lived for many years in Providence, where he had been associated with the Providence Paper Company. He retired from business six years ago.

He was a member of the Longwood Cricket and Tennis Club of Brookline, and a former member of the East Side Tennis Club and the Old Pen and Pencil Club of Providence. He had travelled widely in this country, Europe and Africa.

Surviving are his wife, the former E. Pauline Quimby; a sister, Mrs. Jack Masury of Boston; two brothers, Willard E. of Providence and Arthur E. of Quincy, Mass., and a sister-in-law, Mrs. Winfred I. Binford of Dorchester, Mass.

F. E. Saecker

APPLETON, Wis., November 25, 1940—F. E. Saecker, president of the Appleton Machine Company since its organization in 1882, died at 7:15 Thursday evening, November 21, at his home after a week's illness. He was 86 years old. He was prominently known for many years in the paper machinery field.

Mr. Saecker was born in Germany September 1, 1854, and came to America with his parents when 11 years old, the family settling at Oak Grove, Wis. He came to Appleton in 1874 and had charge of the blacksmithing department of the Appleton Manufacturing Company until the machine company was formed. He also organized the Scolding Locks Corporation in Appleton for the manufacture of hairpins. He was a member of the Methodist church and the Masonic Lodge. The only immediate survivor is a daughter, Mrs. Herman F. Heckert, with whom he made his home.

Arthur D. Coffin

Arthur D. Coffin, Connecticut paper manufacturer, died at his residence at Windsor Locks, Conn., on November 20 at the age of 72. He was born and had always resided in Windsor Locks.

He had been chairman of the board of the firm of C. H. Dexter & Sons since his retirement as president of the company four years ago. He was a past president of the Hartford County Manufacturers Association and former head of the Tissue Paper Manufacturers Association.

His son, Dexter Drake Coffin, and a sister, Mrs. Thomasine Hackell Conanty of Hartford, survive.

Pulp Improves

[FROM OUR REGULAR CORRESPONDENT]

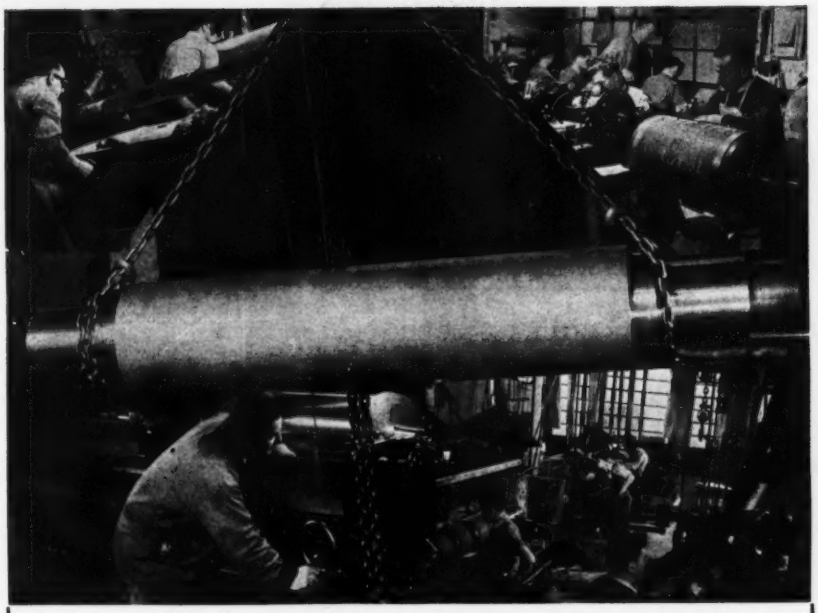
APPLETON, Wis., November 25, 1940—The pulp situation, which has been a bottleneck in the paper industry, is straightening out, declares D. C. Everest, president and general manager of the Marathon Paper Mills Company, Rothschild, Wis., and head of the U. S. defense commission's pulp and paper section. Mr. Everest is dividing his time between his business and his work in Washington, D. C.

He finds that pulp production has been speeded up considerably in domestic mills, and that greater imports are coming in from Canada. He sees little danger of shortage, because three new mills have been built recently in the South, and the continuing duty-free supply from Canada will overcome the lack of adequate capacity in the United States. He also finds rag supplies for higher grades are entirely sufficient.

Newsprint is expected by Mr. Everest to remain at the same price level next year. Imports are now chiefly from Canada, since the supply from Sweden and other European countries has been cut off. Canada is now making a higher grade of newsprint than before the war.

Paper exports to South America this year will be about four times the amount of normal export, Mr. Everest reveals. This is due primarily to the fact that German and British markets have been shut off. Exports are principally of paper board and cheaper grades, since the South American countries have never been accustomed to high-grade papers.

Mr. Everest's principal work with the defense commission is to guarantee an adequate supply of paper of all sorts for all uses. The research section gives him estimates as to how much of the product will be needed through 1942 for specific contracts. An effort is made, he says, to secure sufficient supplies within the same area in which they will be used, but this cannot always be done. He finds generous cooperation among the members of the commission.



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C. E. Harrison Made General Manager

C. E. Harrison, vice president of the American Engineering Company, Philadelphia, Pa., has been appointed general manager. He will have general supervision of the entire activities of the company in addition to his duties as vice president.

Mr. Harrison is a mechanical engineering graduate of the Carnegie Institute of Technology. He served in the U. S. Navy and first became associated with the American Engineering Company in 1913 as a field inspector.

In 1916, he became manager of the service department and remained in that capacity until 1936 when he was made works manager. He was elected to the Vice Presidency in 1938.

Mr. Harrison has been actively identified with the work of all the divisions of the Company—Taylor Stokers, Lo-Hed Hoists, Hele-Shaw Pumps and A-E-CO Marine Machinery. He has been granted a total of 50 patents in the United States and foreign countries.

PAPER
TRADE JOURNAL
This Reg. U. S. Pat. Off.

Henry J. Berger
EDITOR

Vol. 111 November 28, 1940 No. 22

THE MILL NUMBER

The PAPER TRADE JOURNAL annually each fall at this time, following a custom of long standing, presents its Mill and Mill Equipment Number. This number is devoted to descriptions and illustrations of new mills that have been built during the year and improvements that have been made to going plants in the recent past.

The impressing progress that is being made in the pulp and paper industry can not be more effectively visualized, it is believed, than through the agency of the Mill and Mill Equipment Number. Not all the new mills, of course, could be described in this issue, and, as a matter of fact, those completed early in the year have already been described in previous issues of the PAPER TRADE JOURNAL; and, obviously, not all the improvements to the going mills could be handled in a single issue. But, it is believed that the material presented here does furnish an effective cross section of what is going on in the pulp and paper industry throughout the country in the way of improvements and expansion.

The chief feature of the current Mill and Mill Equipment Number is an article with many illustrations of the great new pulp and paper mill of the Hollingsworth & Whitney Company at Mobile, Ala. This mill, which was only placed in commercial operation several weeks ago, is the last word in equipment, design and construction for the manufacture of pulp and paper. It has ample wood resources not far removed from the mill and in every way seems destined to make a reputation as one of the outstanding pulp and paper mills of the country.

Another high light of the current issue is the article describing the new paper making unit of the Champion Paper and Fibre Company at Houston, Texas. This article also is effectively illustrated and presents a picture of another mill that is thoroughly up to date from every angle. The Champion paper mill will largely make machine-coated book paper which will be furnished to the great nationally circulated magazines, *Fortune* and *Life*. The pulp mill of the Champion Paper and Fibre Company at Houston was built some years prior to the completion of the paper mill. It manufactures bleached sulphate pulp and was the first mill erected in the South to make this variety of pulp from Southern pine. The pioneering work which the company has done in this particular field is only one of the factors which has made the Champion known far and wide as one of the most progressive concerns in the paper field.

Among features having to do with improvements, there will be found in this issue very interesting articles on the plant of the Flambeau Paper Company at Park Falls, Wis. Hummel-Ross Fibre Corporation at Hopewell, Va. and the Bathurst Power and Paper Company, Ltd., Bathurst, N. B. Last, but not least by any means, there will be found in both the text and the advertising pages of this section descriptions of much new equipment that deserves the serious attention of every one engaged in the making of pulp and paper.

Influenced largely, undoubtedly, by the greatly disorganized conditions in other parts of the world, attention continues to be focused increasingly on the South as a paper making center. Four great mills in addition to those placed in operation recently are under construction in this territory and rumors, more or less reliable, are in constant circulation regarding other projects to be started soon. All this is exceedingly interesting and, if good business judgment continues to be exercised in the future as, on the whole, it has been in the past in connection with this development in the South, prospects would seem to point to a very bright future, indeed, for the pulp and paper industry in general and for the Southland in particular.

PRODUCTION STEADILY EXPANDS

Improvements in mill plants by the expansion of needed facilities in the erection of buildings and more widely, by the replacement of old machinery and supplies with the latest type of equipment, is an important phase of industrial progress. In comparison with some other major industries the paper industry has a somewhat high plant investment per dollar of manufactured product. The ratio of salaries plus wages is also relatively high, being over 24 per cent for paper, about 17 per cent for the leather industry and approximately 15 per cent for transportation and equipment.

A high proportion of technical and skilled workers is necessary for the successful operation of paper and pulp mills and a large unit investment is required. This means that the paper industry affords one of the important basic industrial markets for relatively expensive equipment. As the many improvement programs of individual concerns included within this single issue of the PAPER TRADE JOURNAL indicates, there exists a constant demand of paper manufacturers for new and more efficient machines and supplies which will contribute to make a better product, and to manufacture standard products with less delay and more economically. Because of the

very substantial technological progress steadily being made in the paper industry it forms one of the greatest quality markets for manufacturers of industrial equipment.

Paper manufacturers are generally scientific buyers and are chiefly interested in quality and service. Although initial investment or first costs of machinery and supplies is important, efficiency and economy of operation, with relatively low maintenance expense and dependable service, are the primary considerations. Through their cooperation with the paper industry, manufacturers of industrial equipment of all kinds have themselves made important contributions to the economic progress of the paper industry. Few industries have made so rapid and sustained a rate of progress as has occurred in the paper industry, particularly during the last century. As the American Paper and Pulp Association pointed out in its monthly bulletin of last July, "the paper industry has developed more rapidly compared on an index basis with similar date for some of the other important industries in the United States, namely, agriculture, mining, manufacturing, railway and telegraph."

Commenting on this data, the association report states that only "mining production shows an increase comparable with the increase in paper production and even here in recent years, there has been a leveling off in the production of minerals, with little or no advance beyond the levels of the decade of 1920 to 1930. Similarly, in the case of railways and telegraphs and in manufacturing production, the rate of expansion since the "twenties" has been insignificant. The paper industry, however, has continued to expand through all the varied economic episodes of the past hundred years, and, unlike most industries, which have not yet recovered from the recession of the early "thirties," has now resumed the rising trend lines of the early decades of the twentieth century. Technological developments within the industry are continually making it possible to substitute paper and paper board products for other material."

Increases in productive efficiency in the paper and allied products industry, according to a recent Brookings Institution survey, reveals that "since the early 'twenties' consumers have benefitted by price reductions amounting to $172,000,000 annually. Between 1923-24 and 1936-37, man-hour productivity increased 52 per cent. As a result, the consumer could buy 40 per cent more for his money. Output, increasing 50 per cent, approximately kept pace with productivity. As a result, despite substantial reduction in working hours, the number of workers increased 12 per cent." Expansion within the industry and the contribution of mill equipment and supplies by manufacturers from without, have made this notable progress in the past and the present trend indicates that it will steadily continue.

Production Ratio Report

These statistics are based upon paper production reports to the American Paper and Pulp Association.

COMPARATIVE MONTHLY SUMMARIES[1]

Months	1940	1939	1938	1937	1936	1935	1934
January	90.2%	77.5%	63.9%	90.3%	76.1%	65.8%	.....
February	86.2%	81.7%	68.7%	90.1%	77.9%	70.0%	.....
March	83.9%	84.0%	69.6%	90.3%	76.0%	70.5%	.....
April	86.3%	82.9%	68.3%	92.1%	82.3%	70.0%	.....
May	91.8%	80.2%	69.0%	90.6%	81.6%	69.4%	.....
June	93.8%	79.7%	66.0%	87.3%	80.7%	72.3%	.....
July	87.1%	75.2%	72.0%	81.8%	77.3%	64.9%	.....
August	87.2%	82.9%	77.2%	82.9%	81.5%	70.9%	.....
September	83.3%	88.7%	76.3%	78.6%	80.5%	71.9%	58.2%
October	88.2%	96.6%	82.5%	73.5%	87.6%	75.6%	64.7%
November	.....	97.2%	79.6%	61.9%	88.0%	75.3%	61.7%
December	.....	91.1%	74.4%	54.5%	85.9%	71.2%	59.6%
Year Average	.....	84.9%	72.3%	80.6%	81.3%	70.5%	.....
First 46 weeks	87.9%	83.9%	72.0%	84.1%	80.7%	70.3%	.....

COMPARATIVE WEEKLY SUMMARIES[1]

CURRENT WEEKS, 1940		CORRESPONDING WEEKS, 1939	
October 12	88.8%	October 14	96.9%
October 19	87.4%	October 21	98.6%
October 26	88.6%	October 28	97.9%
November 2	88.6%	November 4	98.0%
November 9	88.2%	November 11	98.1%
*November 16	89.0%	November 18	98.4%

The following statistics show the number of mills reporting by ratio groups:

	Number of Mills Reporting—Current Weeks					
Ratio Limits	Oct. 12, 1940	Oct. 19, 1940	Oct. 26, 1940	Nov. 2, 1940	Nov. 9, 1940	Nov. 16, 1940
0% to 50%	51	54	44	44	47	38
51% to 100%	243	239	248	245	234	191
Total Mills Reporting	294	293	292	289	281	229

Paperboard Operating Ratios

Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1936	62%	67%	67%	70%	69%	70%	69%
1937	80%	86%	86%	88%	85%	77%	66%
1938	54%	60%	61%	57%	58%	56%	57%
1939	60%	67%	71%	69%	64%	67%	63%
1940	71%	70%	69%	70%	76%	79%	72%

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1936	75%	78%	82%	80%	74%	72%
1937	74%	69%	65%	55%	45%	73%
1938	66%	66%	70%	65%	59%	61%
1939	72%	74%	84%	81%	71%	70%
1940	74%	72%	79%	....	....	....

Week end. Oct. 12, 1940—79%
Week end. Oct. 19, 1940—78%
Week end. Oct. 26, 1940—80%
Week end. Nov. 2, 1940—80%
Week end. Nov. 9, 1940—78%
Week end. Nov. 16, 1940—77%

[1] Production-capacity ratios are based upon six-day capacity ratings which are adjusted periodically to correspond with the ratings reported by individual companies. Ratios are subject to revision until all reports are received.
* Preliminary figure.

May Increase B. C. Timber Royalties

[FROM OUR REGULAR CORRESPONDENT]

VANCOUVER, B. C., November 16, 1940—An increase in British Columbia timber royalties is said to be contemplated in the amendment to the Forest Act announced in the speech from the throne.

Increase in stumpage on timber in some sections of British Columbia, and a return to the system of fixing stumpage rates upon the basis of value, accessibility and cost production, have already been put into effect.

After the financial crash of 1929, the government, in order to keep lumber camps and mills operating, reduced the stumpage charges. Now it is felt that the lumber industry is in position to pay higher rates.

The increases will be felt in the northern interior of the province to a greater extent than on the coast, as there is more crown timber there. On the coast most of the stands have been alienated.

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Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Rigidity, Stiffness, and Softness of Paper and Paperboard

TAPPI Tentative Standard T 451 m-40

Scope

This method is adapted for determining the flexural resistance of paper or paperboard, the stiffness of fibrous material, the limpness or flabbiness of paper and the softness of tissues.

Definitions

For the purposes of this method the terms used are defined as follows:

The *Rigidity* of a paper or paperboard is its property of resisting an applied bending force, its flexural resistance, and is proportional to EI, where E is Young's modulus and I the moment of inertia.

The *Rigidity Factor* is proportional to the modulus of elasticity E, or modulus of rigidity, which is a measure of the rigidity of the structure of the sheet, being a specific property of the material and the way it is put together inside the sheet.

The *Stiffness* of paper or paperboard is its ability to support its own weight, the inverse of flabbiness or limpness. It is proportional to EI/W, where W is the basis weight.

The *Softness* of a paper is the feeling of softness when a sheet is crumpled in the hand. This depends upon the ease of crumpling, together with the absence of sharp edges in the crumpled sheet. It is inversely proportional to the rigidity EI modified by a function of the thickness of the sheet.

Apparatus

The apparatus used shall consist of a clamp formed by a pair of flat jaws or rollers adapted to grip the end of a 2-inch wide strip of material to be tested along a horizontal axis at right angles to its length. The jaws or rollers shall be mounted on a spindle so as to enable the clamped end of the strip to be rotated about that axis, and means shall be provided for indicating when the clamped end of the strip has been rotated axially through a right angle from any initial position. The edges of the clamping surfaces shall be coincident.

Before use, the instrument shall be levelled so that the axis of the clamping edges is horizontal.

Also required are:

a. Rule accurately graduated in millimeters.
b. Scale for accurately determining the basis weight.
c. Standard thickness micrometer.

Test Specimen

The specimens for test shall be cut with clean and parallel edges in each principal direction of the paper, 15 to 50 mm. (5/8 to 2 inches) wide and over 75 mm. (3 inches) long, or as long as may be convenient. Eliminate any very pronounced curvature of the strips in the direction of their length by rubbing the strip over a smooth edge before testing. Also eliminate in a similar way any curvature across the width of the strips before cutting. In such cases the width of the cut strips should be reduced to the minimum (15 mm.).

Note: A slight curvature in the long direction is immaterial as the procedure automatically compensates for this.

The specimens shall have been sampled and conditioned according to TAPPI standard methods.

Procedure

Conduct the test in an atmosphere conditioned according to the standard method.

Usual Procedure. Place the end of each strip between the jaws of the spindle, and with enough overhanging length so that on rotating the spindle clockwise, the strip being on the left, the strip falls through the vertical to the right, and on rotating the spindle counterclockwise, the strip does not fall back to the left when turned through 90 deg. from that point. Reduce the overhanging length until a slow rotation of 90 $\pm$ 2 deg. clockwise and counterclockwise causes the end of the strip to fall from one side to the other. Measure the effective overhanging length (critical length) from the line where the edges of the jaws or rollers grip the specimen to the end of the strip. With rollers, a little dry carbon black or dyestuff may be blown into the nip to accurately locate the gripping edge and enable a corresponding mark to be made on the framework to serve as a datum for tests made thereafter.

Alternative Procedure. Since the critical length bears a straight-line relationship to the critical angle of rotation, a modification of the above procedure, giving the same result, may be preferable for many tests, especially for very limp samples which, if rollers are used for the clamping surface, may lie against the rolls over an appreciable arc and which otherwise would require an apparatus having flat jaws or rollers of smaller diameter. This modification is as follows:

Insert the strip and determine the critical angle of rotation a_1 for any convenient overhanging length L_1, having the overhanging length long enough so that the angle is over 90 deg. Reduce the length to L_2, giving a new critical angle a_2 which is less than 90 deg.

The desired critical length at 90 deg. is then

$$\frac{(90 - a_2)\ (L_1 - L_2)}{(a_1 - a_2)} + L_2 .$$

With either procedure, not less than 10 strips cut in each of the principal directions of the paper or paperboard shall be tested. If the mean of the highest and lowest results differs from the average of all by more than 5%, test more specimens until there is agreement within this limit. Discard an isolated very high or low result, which is not repeated in duplicate, when a consistent average is obtained without the abnormal result.

Determine the average basis weight and the average thickness of the paper or board according to the standard methods.

Notes: (1) For the softness test on *creped* paper, the basic thickness shall be determined as follows:

Cut strips of the paper in the machine direction about 15 mm. (½ inch) wide and place a single strip between the jaws of the micrometer. With the fingers, slowly and uniformly stretch the paper until it breaks, meanwhile observing the pointer. Take the minimum reading of the pointer just before the strip breaks, to the nearest 0.0001 inch. Repeat this test for 5 strips and average the results.

(2) For facial or other weak tissues the following procedure for determining the basic thickness is preferable and gives similar results to the foregoing:

If an instrument having rollers is used, pass a single strip of the paper back and forth once through the rollers of the instrument, keeping the ingoing end under a slight tension. This smooths out the crepe and enables the basic thickness to be measured directly.

Report

The report shall state, as may be required, the rigidity, rigidity factor, stiffness or softness in each direction to 3 significant figures calculated as follows:*

$$\text{Rigidity} = \frac{L^3 W}{10{,}000}$$

$$\text{Rigidity Factor} = \frac{L^3 W}{100\ T^3}$$

$$\text{Stiffness} = \frac{100}{L^3}$$

$$\text{Softness} = \frac{1{,}000{,}000 \log (t + 1)}{L^3 W}$$

* The constants in the formulas are empirical. For the purpose of these tests they give figures of convenient magnitude.

Where L = average critical length in cm.
T = thickness of a single sheet of paper in thousandths of an inch.
t = basic thickness of a single sheet of creped paper in thousandths of an inch.
W = basis weight in grams per square meter.

To provide a single figure for the "over-all softness" of a paper, calculate the geometric mean of the results for the softness in the machine and cross directions, i.e., the square root of their product, and report this figure as the sheet softness.

State the closing pressures of the micrometer used if not in accordance with the standard.

Precision

Duplicate determinations from samples of the same shipment and on different instruments should agree to within 5%, except for the softness, which should agree within 10%.

Additional Information

For samples which unavoidably have been creased, after determining the basis weight and cutting the strips, the crease may be stiffened by one or two small narrow pieces of thin gummed paper, such as is used for mounting postage stamps.

The width of the specimens may usually be varied within wide limits without affecting the results, provided that the edges are parallel.

For specimens, especially thin paperboard, which are not long enough for testing, attach to the end of the strip a sufficient weight, its center of gravity coinciding with the edge, such that the strip will fall over when the axis is turned through a right angle in either direction. Paper fasteners in the form of small folded pieces of sheet metal are convenient for this purpose. The critical length L may be found approximately by taking the necessary measurements and substituting in the following formula:

$$L = L_1 A$$

$$\text{and } A = \frac{1.0}{1.0 - 0.37 \log \left(\frac{10\ Wa}{wL_1} + 1.0\right)}$$

where L = critical length in cm.
L_1 = actual overhanging length in cm.
a = length of entire strip in cm.
w = weight of entire strip in grams.
W = total added weight in grams.

To simply the calculation, the quantity A may be found from Table I, knowing the ratio Wa/wL_1.

Flopping the strip back and forth, especially when using the method as described in the preceding paragraph, often softens it near the edge of the clamp. Accordingly it is necessary to start with too long a strip and progressively shorten it.

Notes: (1) When extreme accuracy is not necessary, a number of strips of the same size may be placed in a pile with edges coinciding and all the strips tested together, the end points being taken at the positions where at least half the strips flop over. By this means a relatively large area of paper may be tested at once.

(2) Routine testing may be further simplified when made on a given grade of paper by using a fixed overhanging length of a pile of the samples and measuring the flexibility by the total number of degrees through which the spindle must be turned to secure a reversal. The degree readings may be related to the method as given by means of a suitable conversion curve determined experimentally.

(3) For field tests a three-fold pocket rule may be used to give fairly accurate results. The test is made by cutting a parallel-edged strip of the paper and inserting it between two of the folded sections of the rule. Using the third section opened at right angles to the other two as a pointer, and the square edge of the remaining paper to indicate when the sweep of the pointer is through a right angle, the folded section carrying the strip is held in a horizontal position on the edge of a table and rotated. The overhanging length of the strip is adjusted till the required conditions are attained.

(4) For routine testing of softness with a given quality of creped paper, the basic thickness t may be deduced, by a conversion factor previously determined by experiment, from the actual thickness T, determined with a micrometer having jaws with a closing pressure of 0.07 kg. per sq. cm. (1 lb. per sq. in.), which is about one seventh the pressure of the TAPPI standard micrometer.

TABLE I.—RELATIONSHIP BETWEEN Wa/wL_1 AND A

Wa/wL_1	A	Wa/wL_1	A	Wa/wL_1	A
0.0	1.00	1.0	1.63	3.5	2.36
0.2	1.21	1.2	1.71	4.0	2.49
0.3	1.28	1.4	1.77	5.0	2.72
0.4	1.35	1.6	1.83	6.0	2.95
0.5	1.40	1.8	1.89	7.0	3.18
0.6	1.45	2.0	1.96	8.0	3.40
0.7	1.50	2.5	2.10	9.0	3.64
0.8	1.55	3.0	2.23	10.0	3.89
0.9	1.59				

References

Clark, James d'A., "Determining the rigidity, stiffness, and softness of paper," *Paper Trade J.* 100, no. 13:41 (March 28, 1935).

Institute of Paper Chemistry, "The Clark paper softness tester, with an important note on the Gurley stiffness tester, Instrumentation Studies XXXV," *Paper Trade J.* 110, no. 7:29 (Feb. 15, 1940).

Kimberly-Clark Technical Men Meet

APPLETON, Wis., November 25, 1940—A joint meeting of the Engineers Club and the Chemical Engineers Club of the Kimberly-Clark Corporation, Neenah, Wis., was held Wednesday evening, November 20 at Hotel Menasha, Menasha, Wis., preceded by a dinner. About 100 attended. The speaker was G. F. Becker, who described the manufacture and uses of fiber glass products.

Dyestuffs Influence on Paper Opacity*

By E. R. Laughlin[1]

Abstract

The relationship between color, opacity, and the popular conception of brightness is discussed with respect to tinted "white" papers. The influence of the character of light source on the opacifying properties of 21 dyestuffs applied to high and low grade furnishes is also shown. Opacity is expressed by the ration R_0/R_∞ and it is demonstrated that the visual efficiency vatio $V.E.R_0/V.E.R_\infty$ as computed from spectral reflectance curves under I.C.I. illuminant A is in extraordinarily close agreement with the ratio R_0/R_∞ as obtained from Bausch and Lomb opacimeter readings.

The influence of light source is determined by comparing the visual efficiency ratio under I.C.I. illuminants A and C representing average artificial light and average daylight respectively. A basis for comparing the dyestuffs is given.

All dyestuffs exert an opacifying influence; but reddish blues, violets, and blacks are significantly more effective.

The illuminant has a marked influence on the opacifying properties of the least effective dyes, such as very greenish blues, reds, yellows, and oranges but comparatively little influence on the most effective colors.

Of the most effective opacifying colors studied (reddish blues, violets and blacks) which are applicable to medium and high grade furnishes, only the Halopont Blues and Violets exert no deleterious effect on brightness as measured by the G. E. reflection meter.

On low grade furnishes, such as newsprint, the basic violets are shown to exert the greatest opacifying effect, to be influenced least by the character of the illuminant and to cause no deleterious lowering of brightness.

The purpose of this paper is to discuss the relationships between color, opacity, and brightness of paper, particularly tinted white papers where brightness and opacity are of importance. The term brightness is used here in the popular sense to mean that property measured on the G. E. reflection meter or similar device which expresses reflectivity at 458 mμ.

In the paper trade the terms opacity and transparency are used more or less indiscriminately to express varying degrees of translucency.

The dictionary defines opacity as the state of being impervious to light. Opacity is therefore the antonym of both transparency and translucency. Transparent and translucent objects both permit the passage of light, but in the case of transparency a clear view of objects beyond is afforded whereas a translucent object does not afford a clear view of any object. Thus, strictly speaking, no glassine sheet is truly transparent and few printing papers are truly opaque; they are translucent. However, usage has so firmly embedded the term opacity into the papermaker's vocabulary that it is perhaps better to employ it in this discussion.

The question to which this study was intended to provide an answer is: What is the influence of the tinting dyestuff on the opacity of a so-called white printing paper? Since it is obvious that the tinting dyestuff, if it exerts any measurable effect, will tend to increase opacity by its property of absorbing light of certain wavelengths, the question should more properly be stated: Which dyestuffs applicable to the tinting of white paper are the most effective in increasing opacity and what is their influence on measured brightness? It is known, for example, that if sufficient black dye is added to the furnish a completely opaque sheet will eventually result. But when this point is reached the sheet can no longer be classed as a tinted white. It is therefore essential to consider the influence of the color on brightness as well as on opacity otherwise the results may be of little practical significance.

Today there are over 40 dyes, regularly used in the tinting of white papers, excluding mixtures of dyes and instances where the same dye is supplied under different nomenclature by the various sources of supply. From this group of over 40 chemically individual colors the more important members were selected for study and a few others included making a total of 21. But first it was necessary to select a method of measuring opacity and of expressing it.

Estimation of Translucency

To the layman the relative translucency of two or more papers may be qualitatively estimated by two methods: one is to hold the sheets to a light source and mentally note which transmits the most or the least light; the other is to place them over a dark object and note which affords the greatest or least "show through."

In a purely practical sense, both of these tests serve to measure the quality desired in a relatively opaque or relatively transparent paper. The purchaser of glassine bags wants to be assured his peanuts or candy will show clearly through the paper; hence to him either a measure of the light transmitted by the sheet or the measure of the degree of show through when the sheet is placed over a dark object is an indication of the clarity with which his peanuts or candy can be seen through a glassine wrapper.

The purchase of printing paper, on the other hand, desires a minimum of show through. When a sheaf of printed papers is examined, the ink on the underside of the top sheet as well as that printed on the surface of the sheet directly underneath should be apparent to a minimum extent. Hence to him the measure of show through when the sheet is placed on a dark object is an indication of what he terms printing opacity.

A quantitative measurement of light transmission through a sheet is relatively simple to record, and consists merely in properly placing the sheet between

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[1] Member TAPPI, Chemist, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

a light source and a photocell which is equipped with a meter to read per cent transmission directly.

The quantitative measure of show through is likewise quite simple. When a sheaf of printed paper is viewed, the show through of the black ink on the back of the first sheet or on the surface of the second sheet is a constrast in the light reflected from one thickness of the paper backed by black, with that reflected from a multiple pile of sheets. This particular contrast in light reflectivity is expressed by a ratio known as printing opacity, R_0/R_∞ where R_0 is the light reflected from one thickness of the sheet backed by a black object or preferably a black cavity, and R_∞ is the reflectance of a multiple pile of the same paper of sufficient number of sheets, that a further increase in thickness of the pile will not alter the reflectivity. Since black absorbs light, a truly transparent sheet will give no reflection when placed over black and the value of $R_0 = 0$; hence the ratio $R_0/R_\infty = 0$. A truly opaque sheet, on the contrary, will reflect just as much light whether backed by a black object or not; hence $R_0 = R_\infty$ for a truly opaque sheet and the ratio $R_0/R_\infty = 1$. The ratio is generally expressed in per cent so that values ranging from 100 for opaque papers to 0 for transparent papers are obtained.

Other reflectance measurements are also used to express degree of show through such as the ratio of reflectance from a sheet backed by black to that backed by a white object. These are termed contrast ratios and there are a number depending upon the character of the white. A white surface such as magnesium carbonate or magnesium oxide will readily become discolored with use. In the present TAPPI method, a contrast ratio is specified where the white has a reflectance of 89% as may be obtained by protecting magnesium carbonate with a cover glass (*see* TAPPI Standard T 425 m-35).

The literature contains many discourses on the relative merits of printing opacity, contrast ratios and transmission measurements. However, the subject has been so thoroughly covered in one of the instrumentation studies *(1)* of The Institute of Paper Chemistry that it would be futile to attempt to supplement it at this time.

For the present work, the printing opacity ratio R_0/R_∞ was selected as the basis for expressing opacity, not only because it measures most correctly the show through observed in reading printed matter, but also because it lends itself more readily to measurement on different instruments and is less subject to experimental errors than contrast ratios.

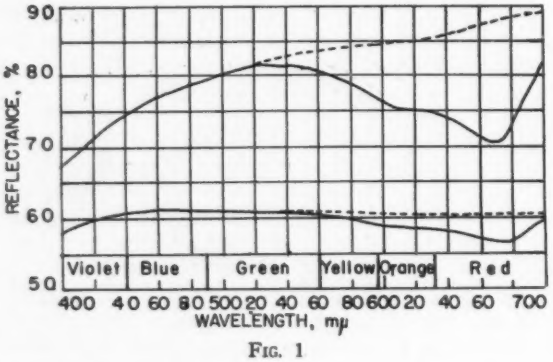

FIG. 1

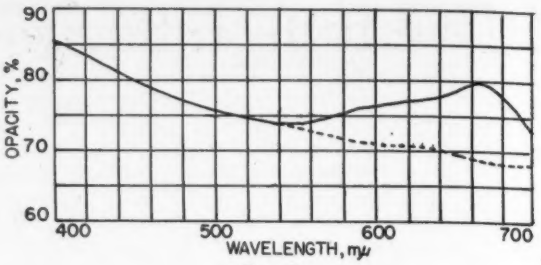

FIG. 2

Choice of Light Source

The next consideration is a very important one, namely the choice of light source for making reflectance measurements, for it is well known that the reflectance of a colored object varies with the wavelength of light and with the color of the object. Because it is a fundamental property of every color to absorb certain wavelengths of light and reflect others it is obvious that every dyestuff under investigation will reflect light differently; consequently every dyestuff may exert entirely different influences on opacity, depending upon the character of the light with which R_0 and R_∞ readings are made. This is shown in Fig. 1. The top and bottom dotted lines represent, respectively, the R_∞ and R_0 reflectances of an uncolored sheet at every wavelength of light within the visible spectrum. The solid lines show the R_∞ and R_0 reflectances of a similar sheet tinted with Methylene Blue.

The approximate ranges for violet, blue, green, yellow, orange, and red light have been indicated on this chart. The sheet tinted with Methylene Blue has a greenish blue appearance because the yellow, orange, and red light have been absorbed by the color letting blue and green light predominate in the reflected light.

It is interesting to note that up to a wavelength of 520 mμ or thereabouts both the tinted and uncolored sheets reflect exactly the same amount of light whether backed by black or not. Therefore the sheets have the same printing opacity when reflectance measurements are made with light of any wavelength up to 520 mμ. Above this wavelength the colored sheet absorbs more light than the blank and hence reflects less so that at 670 mμ the maximum difference occurs. This point is known as the wavelength of maximum absorption of the dye and is characteristic of that dye. Now suppose R_0 and R_∞ readings are taken from this chart at 10 mμ intervals across the spectrum for both the colored and uncolored sheets and that the ratio expressing printing opacity is plotted against wavelength. Figure 2 shows such a plot, the dotted line being the printing opacity of the uncolored sheet and the solid line the printing opacity of the sheet tinted with Methylene Blue.

Maximum Opacifying Influence

It will be noted that the maximum printing opacity occurs at a wavelength of 670 mμ which has been shown to be the wavelength of maximum absorption of Methylene Blue.

As another illustration consider in Fig. 3 the case of an uncolored sheet and one tinted with a direct orange, Fast Orange WS. The dotted lines again refer to R_∞ and R_0 reflectances for the blank and the solid lines to the colored sheet reflectances.

The colored sheet appears orange to the eye because the violet, blue, and green lights absorbed whereas yellow, orange, and red are predominate in the reflected light. The wavelength of maximum absorption is about 500 mμ, and it is at this wavelength that the orange sheet differs to the greatest extent from the uncolored sheet in opacity as shown in Fig. 4.

The two sheets have the same opacity at wavelengths above 580 mμ.

From this it becomes obvious that any dye will exert its maximum opacifying influence when measurements (either reflectance or transmission) are made with light of the particular wavelength absorbed to the greatest extent by that dye, i.e., the wavelength of maximum absorption of the dye.

It is thus possible to conceive of three sheets, identical in all respects except that one is uncolored, one is colored with a greenish blue, and the other with an orange. In red light of a wavelength of 670 mμ the *blue* sheet will be definitely more opaque and the others equally inferior. In greenish blue light of wavelength 500 mμ the orange sheet will be definitely more opaque and the others equally inferior. The question quite naturally arises as to what light is best suited to the measurement of opacity because it is obvious that regardless of the illuminant selected some dyes will be more effective than others and with a change in illuminant a reversal in opacifying influence is possible, such as was the case with the orange and blue tinted sheets when examined first in red light and then in greenish blue light.

Natural and Artificial Illumination

Thus far only monochromatic light has been considered, i.e., light of one particular wavelength. It is well known that daylight contains some light of all wavelengths. Also a moment's reflection will show that any printed matter such as books, magazines, or newspapers are read by both daylight and artificial light. Similarly articles packaged in glassine are sold from store counters or exhibited in window displays illuminated by both daylight and artificial light. Hence a good glassine sheet should be highly transparent in both daylight and artificial light just as printing paper should have high printing opacity under both lighting conditions.

It is recognized that in artificial illumination the light of longer wavelengths predominates, whereas in daylight the converse is true and light of shorter wavelengths predominates. The inference from this is—returning to the orange and blue example—that the orange sheet will be the more opaque in daylight, whereas the blue will be the more opaque in artificial

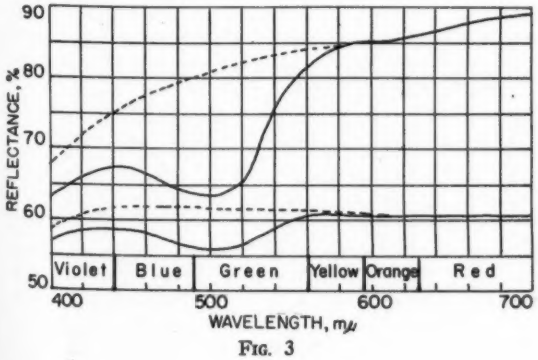

FIG. 3

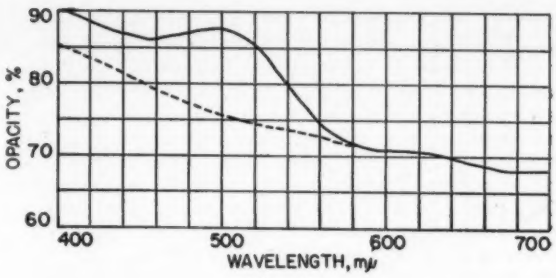

FIG. 4

light. However, before making too many inferences and leaping to the impractical conclusion that morning newspapers should be tinted with one color and evening newspapers with another, it is perhaps better to see how much difference the light source actually does make. This may be conveniently accomplished by comparing the opacity of a number of variously tinted samples as measured first in *average artificial light* and then in *average daylight*. Thus into the original question must be injected the matter of illumination if a true picture is to be presented. The revised question now reads: Which dyestuffs applicable to the tinting of white papers are the most effective in increasing opacity; what is their influence on measured brightness; and what effect does illumination exert on their opacifying properties?

Light and Heat Energy

COLOR TEMPERATURE

Light and heat energy are so closely related that it is frequently more convenient to express one in terms of the other as is done in the practice of expressing light sources as color temperatures. The color temperature of an illuminant is that temperature to which a black body must be heated in order that the distribution of its radiated energy is equivalent to that of the light source.

It is justifiable to assume that *average artificial light* is that from a tungsten filament bulb of 100 watts or less. Such lamps have a color temperature of 2400 to 2800 deg. K. (Kelvin). This corresponds to the present TAPPI specification for the light source to be used in opacimeters.

The International Commission on Illumination (I.C.I.) in 1931 adopted as a standard representing average artificial light, a source with a color temperature of 2848 deg. K. which is essentially equivalent to the TAPPI opacimeter illuminant. This source was designated illuminant *A*. The relative energy distribution increases as the wavelength increases and reaches a maximum at the red end of the spectrum. The I.C.I. also adopted as fairly representative of average daylight a light source with a color temperature of 6500 deg. K. This was designated as illuminant *C*. The energy distribution of this source is smaller at the red end of the spectrum and increases with decreasing wavelength until a maximum is obtained at 450 to 475 mμ in the blue portion of the spectrum.

The reflectivity or true brightness (visual efficiency) of an object when viewed by a normal eye under any given illuminant is not only a function of the spectral reflectance curve of the object and the energy distribution of the illuminant but is also a function of the visibility curve for a normal eye. The relative brightness to a normal eye of equal

amounts of energy at various wavelengths when plotted gives a curve with a maximum at 555 mμ which falls off to substantially zero at 400 and 700 mμ. The reflectivity of paper in average artificial light as seen by a normal eye may be obtained by integrating the area under the spectral reflectance curve of that paper in terms of the product of the energy distribution curve for illuminant *A* and the normal visibility curve. This is readily accomplished by the selected ordinate method *(2)* and the result is the visual efficiency or *Y* tristimulus value.

It has been pointed out elsewhere *(1)* that if this process is carried out on R_0 and R_∞ spectral reflectance curves for a given paper, the ratio of the reflectance values obtained which is actually a visual efficiency ratio, is a measure of printing opacity. This ratio should agree with that obtained on an opacimeter employing a light source as specified by TAPPI with the important provision that the response of the photocell in the opacimeter approximates the visual response. If this were not the case the opacimeter would be of little practical value anyway because it would be impossible to correlate its readings with visual opacity judgments.

Practicability of Opacity Determination Method

In order to demonstrate the practicability of the spectrophotometric determination of opacity a series of 43 handsheets was prepared from rag stock with particular attention to uniformity of basis weight and formation. Nineteen selected dyestuffs were applied each in two different concentrations and five uncolored blanks made. The weaker dye concentration approximated the depth of a slightly deeper than average tinted white. The other was 1.5 times this depth.

R_0 and R_∞ spectrophotometric curves were run on these sheets using the General Electric recording spectrophotometer and the visual efficiency ratio V.E.R_0/V.E.R_∞ for I.C.I. illuminant *A* determined by the method just described.

These sheets were then submitted to an independent laboratory for opacity readings on the Bausch and Lomb opacimeter which is one employing a photocell the response of which approximates the visual response. The opacimeter was adjusted to give R_0 and R_∞ readings on the basis of magnesium oxide = 100% which is the same standard as used on the recording spectrophotometer. Table I shows the printing opacity ratios as determined by the two methods together with the plus and minus deviations. The net average difference is less than 0.3 lower for the recording spectrophotometric method. In only two out of the 43 comparisons was a difference greater than 2% obtained. The average deviation is 0.79 and the probable error 0.68 or 0.86%.

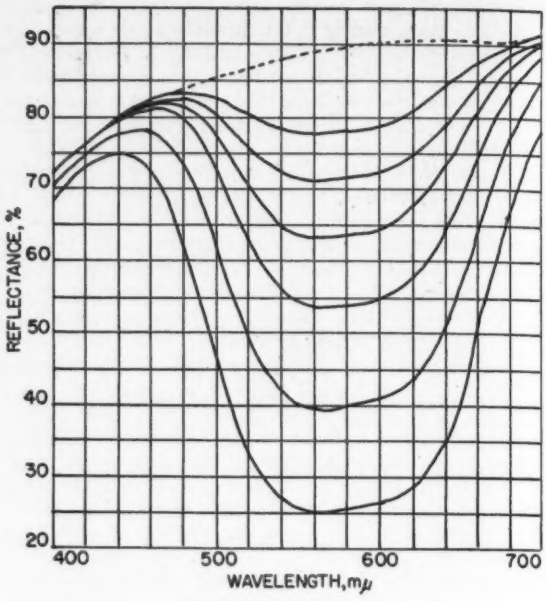

FIG. 5

This may be considered unusually good agreement and such being the case the influence of the illuminant may be determined quite simply from the same spectrophotometric curves by calculating the visual efficiency ratio V.E.R_0/V.E.R_∞ for I.C.I. illuminant *C*, i.e., average daylight. Now that a manner of expressing opacity has been selected, a means of measuring it established and a convenient method found for determining the influence of the illuminant, there still remains one additional barrier to hurdle. This is the selection of a suitable basis for comparing the opacifying tendencies of the various colors. The dyestuffs under consideration are of different hue,

TABLE I.—PRINTING OPACITY COMPARISON AS MEASURED ON BAUSCH & LOMB OPACIMETER AND AS DETERMINED FROM SPECTRAL REFLECTANCE CURVES BY CALCULATING THE VISUAL EFFICIENCY RATIO FOR I.C.I. ILLUMINANT *A*.

Sheet	B. & L. $\frac{R_0}{R_\infty}$ %	G.E.R.S. $\frac{\text{V.E.}R_0}{\text{V.E.}R_\infty}$ %	+	−	Sheet	B. & L. $\frac{R_0}{R_\infty}$ %	G.E.R.S. $\frac{\text{V.E.}R_0}{\text{V.E.}R_\infty}$ %	+	−
1	74.4	73.1		1.3	23A	86.8	86.9	0.1	
2	82.1	83.1	1.0		24A	81.3	81.1		0.2
3A	79.8	81.3	1.5		25A	82.5	82.3		0.2
4	80.9	81.1	0.2		26	79.4	80.3	1.4	
5	80.9	82.0	1.1		27A	84.2	83.8		0.4
6	81.1	81.3	0.2		28A	81.0	81.9	0.9	
7	83.4	83.4			29B	82.4	83.2	0.8	
8	80.4	81.1	0.7		30A	80.0	80.5	0.5	
9A	78.5	78.6	0.1		31A	81.8	81.2		0.6
10	82.4	82.2		0.2	32	73.0	72.2		0.8
11A	78.5	78.9	0.4		33A	72.3	70.5		1.8
12	77.0	75.6		1.4	34A	75.6	73.5		2.1
13	77.6	76.8		0.8	35A	74.2	74.0		0.2
14A	79.5	79.7	0.2		36A	76.4	75.2		1.2
15A	82.9	81.9		1.0	37	78.0	78.0		
16A	81.6	82.2	0.6		38	79.6	79.4		0.2
17	78.9	80.0	1.1		39A	77.9	76.6		1.3
18	82.6	81.9		0.7	1-10	74.3	74.1		0.2
19A	80.3	80.0		0.3	1-30	74.1	72.6		1.5
20	78.1	77.1		1.0					
21A	78.5	75.9		2.6	1A1	74.3	72.7		1.6
22	82.1	82.1			1A2	75.4	73.6		1.8

brightness, and strength. Obviously a basis of equal weight of dye would be futile. Likewise an attempt to produce dyeings of equal depth would be difficult because of the variation in judgment between different observers when the variation in hue is great. It is known that the more dyestuff added to a pulp the greater will be the decrease in reflectance. Figure 5 shows a family of curves obtained by adding increasing quantities of Halopont Brilliant Blue 2RN to a pulp. It seems reasonable to assume that, at least in the range of tinted whites, a decrease in reflectance of the uncolored stock by a constant percentage would afford a fair basis of comparison.

Figure 6 shows in the top dotted line the R_∞ curve of an uncolored sheet. The bottom dotted line has been drawn to show a 15% decrease in reflectance when measured at any wavelength. The solid lines show the reflectances of two colored sheets, one tinted with a violet, the other with a blue and it will be noted that sufficient dye was used in each case to decrease the reflectance of the pulp exactly 15% when measured at the wavelength of maximum absorption of the dye. Experiment has demonstrated that a series of sheets so prepared ranging in hue from greenish blue to violet will appear visually equal in color depth as well as visually equally removed from white. Furthermore they will be found to possess substantially equal excitation purities when plotted on the chromaticity diagram. This is not nearly so true in the case of reds and yellows but the differences are not great. Consequently the basis of sufficient dye to lower the R_∞ reflectance of the pulp by exactly 15% when measured at the maximum absorption wavelength of each dye, was adopted for comparing the opacifying properties of the various colors.

Curve Correction Method

It would be extremely fortuitous were it possible to prepare dyeings of 20-odd colors to meet this requirement without forming several hundred sheets. It is useless to attempt to do so when there is a relatively simple and accurate, though somewhat tedious, method available for the adjustment of the curves already prepared. It will be recalled that these curves were made at two different concentrations of each dyestuff under investigation. The lower concentrations varied in decreased reflectance values from 13 to 18%, whereas the higher concentration decreased the reflectance of the pulp by 20 to 25%.

The curve correction method is based on the extention of the theoretical equation of Kubelka and Munk *(3)* to dyed handsheets by Nolan *(4)* in 1937 and Foote *(5)* in 1939. When light strikes an opaque pad of paper part is absorbed, part reflected, and part scattered. It has been shown that in low concentrations of dyestuff the pulp and dye absorb and scatter the light independently of one another; also that at these same low concentrations the ratio of the absorption coefficient to the scattering coefficient (K/S) for the dye alone is approximately proportional to the concentration of dye. The equation $K/S = (1-R_\infty)^2/2R_\infty$ expresses the ratio of absorption coefficient K to scattering coefficient S in terms of the monochromatic reflectivity R_∞.

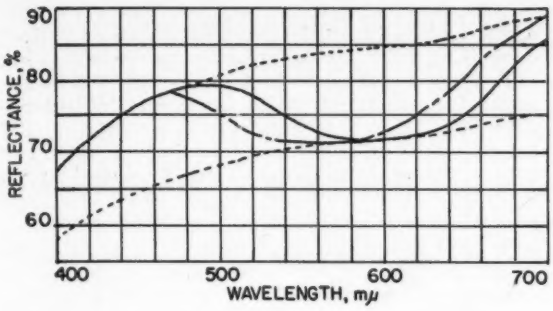

FIG. 6

Table II contains an illustrative example of curve adjustment. Column 1, $R_\infty s$ lists the R_∞ reflectance values of the uncolored stock at the ten selected ordinates for I.C.I. illuminant *A*. Column 2, $R_\infty(d+s)$ lists the corresponding reflectance values of the tinted sheet. Columns 3 and 4 list the K/S values of columns 1 and 2 respectively. It is convenient to prepare a table from the equation which gives the value of K/S for every value of R_∞ from 0 to 100. K/S may then be read directly from this table. Column 5, $\Delta\ K/S$ is the difference in K/S values listed in columns 3 and 4 and is the K/S value for the dye alone. Column 6 is this value multiplied by the proper factor. Column 7 is the sum of columns 6 and 3. To the adjusted K/S value of the dye alone has been added the K/S value for the stock and the corresponding value of R_∞ is listed in column 8 which contains the reflectance value of the adjusted R_∞ curve at the ten selected ordinates.

The wavelength of maximum absorption of the dye in this instance happened to coincide with the sixth ordinate and the R_∞ value for the dyed sheet at this point is 69.5%. The corresponding R_∞ value of the uncolored stock is 83.4%. The quantity of dye in the tinted sheet has therefore decreased the reflectance of the pulp by 16.7%. It is desired to know what R_∞ values would result had a quantity of the same dye been used which decreased the reflectance of the pulp by exactly 15% when measured at the dye's maximum absorption wavelength. A 15% reduction from the 83.4% value of the stock is 70.9%. Therefore at the sixth ordinate the value of 70.9 is placed in column 8 and its K/S value determined (0.05972) and placed in column 7. The K/S value of the stock at this wavelength is 0.01652

TABLE II.—ILLUSTRATIVE EXAMPLE OF ADJUSTING THE R_∞ CURVE OF A TINTED PAPER TO A PRESELECTED VALUE AT ITS WAVELENGTH OF MAXIMUM ABSORPTION

	1 $R_\infty s$	2 $R_\infty (d+s)$	3 $K/S\ s$	4 $K/S\ (d+s)$	5 $\Delta K/S$	6 $5\ (f)$	7 $6+3$	8 Std. R_∞
1	81.0	76.3	0.02228	0.03681	0.01453	0.01243	0.03471	76.9
2	82.2	72.8	0.01927	0.05081	0.03054	0.02615	0.04542	74.05
3	82.7	71.0	0.01809	0.05923	0.04114	0.03527	0.05336	72.2
4	83.0	70.0	0.01741	0.06429	0.04688	0.04015	0.05756	71.35
5	82.2	69.5	0.01696	0.06692	0.04992	0.04270	0.05966	70.9
6	83.4	69.5*	0.01652	0.06692	0.05040	0.04320	0.05972	70.9
7	83.6	69.7	0.01609	0.06586	0.04977	0.04260	0.05869	71.1
8	83.9	70.0	0.01545	0.06429	0.04884	0.04180	0.05725	71.4
9	84.1	70.7	0.01503	0.06071	0.04568	0.03910	0.05413	72.1
10	84.8	73.0	0.01362	0.04993	0.03631	0.03110	0.04472	74.2

* At wavelength of maximum absorption $f = .857$

which when subtracted from 0.05972 leaves 0.04320 or the K/S value for the dye alone when the decrease in reflectance is exactly 15%. Since the K/S value of the dye alone for a 16.7% decrease is 0.05040, this value would have to be multiplied by a factor of 0.857 to give the K/S when the reflectance is decreased 15%. Therefore a factor of 0.857 is used at the other ordinates for converting the values in column 5 to those in column 6. The balance of the table is then filled out giving in column 8 the adjusted R_∞ values for that particular dyestuff at the ten selected ordinates for illuminant A. The average of column 8 is the visual efficiency under illuminant A and is the V.E. R_∞ value used in calculating printing opacity. The corresponding R_0 value is much simpler to determine and may either be calculated from the equations of Steele *(6)* or read directly from the Bureau of Standards charts prepared by Judd *(7)*. The integrated R_0 and R_∞ values for the sheet decreasing reflectance by 16.7% are known and the R_∞ value for a sheet of the same thickness on the same pulp containing the same dye has been computed for 15% reflectance decrease. By locating the point on the chart for the first set of values and following a constant SX line to the computed standard R_∞ value, the corresponding R_0 may be read directly.

To demonstrate the validity of this curve adjustment technique the curve for one concentration of dye was corrected to that of the other. The observed opacity was 81.46% and the calculated opacity by the method just described for curve adjustment was 81.32%. The agreement is 0.17% and well within the limits of experimental error in reading reflectance values from the curves.

Rag Stock Curves

The curves for the 19 dyes on rag stock dyed at two different concentrations were all adjusted to the 15% decreased reflectance level and the opacities determined under I.C.I. illuminants A and C. The values are tabulated in Table III and the opacifying influence of the dyestuff expressed as per cent increase in the average opacity of the five uncolored sheets as compared with the uncolored sheets.

TABLE III.—INFLUENCE OF COLOR ON OPACITY OF RAG STOCK AS MEASURED FOR I.C.I. ILLUMINANTS *A* AND *C*

Dyestuff and Class	Printing Opacity		Increase in Opacity over Blank	
	Illuminant *A*	Illuminant *C*	Illuminant *A*	Illuminant *C*
	%	%	%	%
Blank (rag stock)	73.23	73.81		
Halopont Colors (dispersed pigments)				
Brilliant Blue 2RN	80.15	80.36	9.45	8.87
Violet N	80.21	80.48	9.53	9.04
Blue MBXN	79.50	79.73	8.56	7.89
Blue GN	79.40	79.35	8.42	7.50
Blue RN	79.53	79.91	8.60	8.27
Ponsol Colors (dispersed vat color pigments)				
Violet RRP Powder	80.32	80.72	9.68	9.36
Blue RP Triple Powder	78.77	78.82	7.56	6.79
Basic Colors				
Paper Blue R Conc.	78.88	78.82	7.72	6.79
Rhodamine B	75.84	76.81	3.56	4.07
Methylene Blue ZX	75.65	75.10	3.30	1.75
Acid Colors				
Violet C4B	77.48	77.21	5.81	4.60
Nigrosine WSB	80.72	80.90	10.23	9.61
Soluble Blue R	79.21	79.77	8.16	8.07
Soluble Blue G	78.00	77.58	6.51	5.11
Direct Colors				
Yellow SXP	73.57	74.43	.46	.84
Fast Orange WS	74.57	75.86	1.83	2.78
Miscellaneous Pigment Colors				
Ochre (mineral pigment)	76.08	77.47	3.89	4.96
Paris Black (carbon black)	80.84	81.18	10.39	9.98
Paper Blue S (Soluble Prussian Blue)	76.51	76.65	4.48	3.85

It is evident that reddish blues, violets, and blacks in general exert the greatest opacifying influence, and that yellows, oranges, reds and greenish blues are of minor influence and in some cases relatively ineffective.

One of the most important conclusions and the answer to the second object of this study, is the fact that the illuminant has inconsequential bearing on the most effective dyes but has a marked influence on the least effective colors. The orange and greenish blue example cited earlier now assumes a different aspect. It is true that Methylene Blue is almost twice as effective in artificial light as in daylight. Likewise Fast Orange WS is 1.5 times more effective in daylight than in artificial light. However, this is of little more than academic interest because both colors under their best conditions of illumination are only about one third as effective as the best reddish blues, violets, and blacks under either illumination.

The answer to the third and last object of this study is relatively simple now that it is known that certain reddish blue, violet, and black dyes are the best opacifying colors under either daylight or artificial light. It is hardly necessary to state that blacks like Nigrosine and Paris Black cause a substantial decrease in brightness. This leaves in the group of most effective colors a vat color pigment Violet RRP Powder, and the class of dispersed pigments known as the Halopont Blues and Violet.

The Violet RRP Powder causes a slight decrease in brightness but the Halopont Blues and Violet do not, even when applied in concentrations up to three times the depth of the average tinted white. Reference to the family of curves in Fig. 5 showing the effect of increasing amounts of Halopont Brilliant Blue 2RN clearly shows that this dyestuff may be added until the reflectance at the maximum absorption wavelength (560 mμ) is decreased almost 30% before there begins to be any apparent decrease at wavelength 458 mμ where brightness is measured.

Increasing Opacity with Ochre

It may also be stated that in this work is found no justification whatever for the practice sometimes employed of adding ochre to increase the opacity of a white paper. The addition of ochre is one of the most effective ways to obtain a low brightness reading since its wavelength of maximum absorption coincides almost exactly with that at which brightness is measured. Furthermore, as an opacifying agent, it is only 40% as effective in artificial light and only 55% as effective in daylight as the nondulling colors just discussed.

A limited study was also made using colors applicable to newsprint. The same procedure was followed as in the study of rag stock. The results on five basic dyes are listed in Table IV.

It will be noted that the opacifying property of dyestuffs is much less on this furnish. While this is partly due to the higher opacity of the uncolored stock, neverthless the same conclusions may be drawn. Violets are most effective, are influenced least by the illuminant and do not cause a decrease in measured brightness. Paper Blue R was used in this work because it is very closely related chemically to Methyl and Ethyl Violets and midway between the two in shade. These three basic violets may be con-

TABLE IV.—INFLUENCE OF DYESTUFFS ON THE OPACITY OF NEWSPRINT AS MEASURED FOR I.C.I. ILLUMINANTS *A* AND *C*

Basic Colors	Printing Opacity		Increase in Opacity over Blank	
	Illuminant *A*	Illuminant *C*	Illuminant *A*	Illuminant *C*
	%	%	%	%
Blank	83.70	84.77		
Paper Blue R Conc. (violet)	86.99	87.95	3.93	3.75
Rhodamine B (red)	85.98	87.30	2.72	2.98
Chrysoidine GN (orange)	83.98	85.52	0.34	0.88
Methylene Blue ZX (greenish blue)	84.71	85.18	1.21	0.48
Auramine (yellow)	83.78	84.98	0.10	0.25

sidered essentially equivalent in opacifying properties and on this particular furnish, newsprint, Rhodamine B is an effective shading agent.

A limited amount of exploratory work was also carried out on a soda-sulphite furnish as well as on a book furnish, i.e., loaded soda-sulphite. The opacifying properties of the dyestuffs tested closely paralleled those given in this study for a rag furnish.

Steele *(8)* has shown that in filled sheets the fiber and filler scatter the light independently of one another. The work on opacifying properties of dyestuffs in loaded furnishes indicates that, at least in the range of tinted whites, the fiber, filler, and dye each scatter and absorb light independently of one another and that the opacifying properties of dye and filler are additive.

Conclusions

A few general statements may be made which are in reality axiomatic. One cannot, by the use of color alone, maintain brightness and decrease opacity without changing the hue of the sheet. Likewise any change in hue of the sheet must influence either brightness or opacity and sometimes both. Furthermore, the brightness of a sheet cannot be altered without changing its opacity or hue. These statements hold true only when all other conditions are constant except color.

With white pigments the situation is different. A great many of them, such as the titanium oxides, calcium carbonates, and the brighter clays, are of higher reflectivity than the average paper fiber. Thus many of them, particularly the titanium compounds, increase both the brightness and opacity of a sheet when added to the furnish. Consequently, by the use of a combination of white pigments and dyestuffs the opacity may be increased and the same hue and brightness maintained.

In closing it should be stated the considerations of the effect of the illuminant were based on average daylight and average artificial light. In the interest of accuracy it should be recognized that average daylight differs considerably from the best daylight conditions likely to be encountered. On a perfectly clear summer day, with a cloudless blue sky, the color temperature of the north sky light may frequently be in excess of 20,000 deg. K. In a very general sense this light differs from I.C.I. illuminant C by about as much as illuminant C differs from illuminant *A*. Therefore the effect of the illuminant as expressed in Tables III and IV is only about half that which could exist between the brightest daylight and artificial light. However, this fact has no bearing whatever on the conclusions of this study because the same colors will be outstandingly more effective under any of these lighting conditions.

In conclusion it is suggested that an average daylight, such as I.C.I. illuminant *C*, would be much better for opacity determinations than the average artificial light now specified.

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Conversion of Holocellulose to Pulp*

Suitable for High-Grade Pulp

By George J. Hajny[1] and George J. Ritter[2]

Abstract

Holocellulose was isolated from fiberized white spruce so as to obtain a product consisting largely of whole fibers. It was then converted to pulp by extraction with dilute sodium hydroxide solution at elevated temperatures. The resulting pulp comprised 59.4% of the wood and had an alpha-cellulose content of 87.6% or 52.0% on the weight of the wood. The pulp was bleachable to 87 parts blue by means of 0.5% bleaching powder having 35.0% available chlorine. The yield of the bleached pulp was 58.1% and its alpha content was 89.5%, or 52.0% on the weight of the wood.

The unbleached pulp had a viscosity slightly over 40 centipoises in cuprammonium solutions; the bleached pulp had a viscosity of about 37 centipoises. They hydrated uniformly on beating, as was manifested by the gradual lowering of their freeness. They produced test sheets after varying beating intervals, which had strength properties commensurate with those of test sheets made from a sulphite pulp of a quality employed for high grade papers.

A previous publication (*2*) records results indicating that holocellulose is easily converted to glassine paper having good strength properties. The results confirm those of an earlier publication (*3*) in which lignin-free pulp amounting to approximately 60% of

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the wood was used. Another article (*5*) shows that holocellulose is an excellent source for high yields of high viscosity alpha-cellulose suitable for cellulose derivatives. A consideration of the results contained in the three foregoing articles suggests that with mild chemical treatments holocellulose might be converted to pulps ranging between those for glassine paper and for cellulose derivatives. Accordingly, the Forest Products Laboratory undertook the conversion of holocellulose to a pulp suitable for the manufacture of high-grade papers.

The high yields of alpha-cellulose obtainable from wood, as pointed out in the previous article (*5*), suggests possibilities of increasing pulp yields. A yield of 41 to 43% of bleached spruce sulphite pulp, which contains as high as 15% of hemicelluloses, is low in contrast with even the yield of 50 to 52% of alpha-cellulose recoverable from the wood (*5*), If, then, a commercial pulping process were developed to retain all the alpha-cellulose in the wood and, in addition, enough of the hemicelluloses to facilitate hydration during beating, the yield of pulp for high grade papers could be increased markedly.

On the other hand, some papermaking data suggest that the yields of the type of pulp considered in this article cannot be increased materially. With exceedingly few exceptions the members of the paper industry consider that bleached pulps comprising over 45% of the wood are unsuitable for making high grade papers. Their conclusion is based upon the fact that, during beating, the pulps hydrate and lose their freeness before adequate strength properties are developed. As a result, papers made from such pulps are rattly and translucent. The rapid hydration and loss of freeness of the pulp are caused, first, by the presence of hemicelluloses containing appreciable percentages of uronic acids originally present in the wood, and secondly, by the presence of hemicelluloses and alpha-cellulose degraded by oxidation and depolymerization during the pulping and bleaching processes.

One precaution to observe, then, for increasing the yields of pulps suitable for high grade papers is to avoid as much as possible degrading them during the pulping and bleaching processes. Observance of the foregoing precaution will result in the retention of increased amounts of undegraded alpha-cellulose and hemicelluloses. If too much of the hemicelluloses is retained in the pulp it will be necessary then to remove, by selective solvents, only the rapidly hydrating portion to attain the desired objective. The residual pulp thus obtained will sufficiently resist rapid hydration and loss of freeness during the early stages of the beating operation and its full strength properties for high grade papers may be developed. Holocellulose, prepared by the analytical procedure by Van Beckum and Ritter (*5*), seems to be an ideal material for conversion to the pulp considered in the present study.

Preparation of Pulp

Isolation of Holocellulose

Wood fiber from white spruce produced by the Asplund process, which entails fiberizing the wood under high temperatures, was employed as a raw material for the preparation of the holocellulose. The Asplund fiber consisted of single wood fibers and bundles of wood fibers differing widely in size.

A wood material, consisting of particles varying over a wide range in size, is difficult to delignify without seriously degrading the fine particles before the lignin can be removed from the coarse particles. Accordingly, the Asplund fiber was separated by means of a fractionating screen into a fraction consisting of the single fibers and a fraction consisting of bundles of fibers. Each of the screened materials had a composition of 2.5% extraneous materials, 70.9% holocellulose, and 26.6% lignin.

Small five-gram batches of the two Asplund fiber fractions were separately converted to holocellulose by the analytical method of Van Beckum and Ritter (*5*) except that the pre-extraction of the wood was omitted. Difficulty was experienced with overheating and degrading the holocellulose when it was prepared in batches of approximately one pound by the standard procedure of Van Beckum and Ritter which specifies that the moist wood be treated with gaseous chlorine. The overheating was prevented and the degrading was reduced by chlorinating a 3% suspension of wood in water. Some of the hemicelluloses were sacrificed by this modification of the procedure. However, the material lost was only a part of the hemicelluloses required to be removed in the conversion of the holocellulose to the desired pulp for high grade papers. The holocellulose was prepared in the one-pound batches from the fine and the coarse fractions of Asplund fiber and was mixed previous to converting it to pulp.

Conversion of Holocellulose to Pulp

Conversion of the holocellulose to a pulp suitable for high grade papers was accomplished after experimenting with different aqueous solvents under varying conditions of temperature and time. The different pulps obtained by extracting the holocellulose with the solvents were tested for their viscosity in cuprammonium solution (*4*) and also for their Schopper-Riegler freeness after different periods of processing in the pebble mill. The results of these tests were a guide in choosing the most promising solvent and conditions of treatment of the holocellulose for the conversion to the desired pulp. A pulp with promising properties was finally produced by extracting the holocellulose, prepared in one-pound batches, with 5% aqueous sodium hydroxide solution at the temperature of the boiling-water bath for two hours. The material so obtained is here designated as the unbleached pulp. A portion of the pulp was bleached to 87 parts blue (Ives) by means of 0.5% bleach powder having 35% available chlorine. This pulp is here designated as the bleached pulp.

The holocelluloses prepared in five-gram batches and also in one-pound batches, the unbleached and the bleached pulps and the respective alpha-celluloses isolated by the method of the American Chemical Society (*1*) from these four cellulose materials were subjected to viscosity measurements in cuprammonium solution (*4*). The results of the viscosity measurements are recorded in Table I. The unbleached and the bleached pulps were also treated in a 1.5-pound beater and test sheets were made from samples of the pulps removed after different processing intervals. Physical properties of the pulps and the test sheets were determined by the TAPPI Standard methods (Table II).

Yields and Viscosity

Table I contains the results on the yield and vis-

TABLE I.—YIELD AND VISCOSITY OF CELLULOSIC MATERIALS FROM WHITE SPRUCE

(Percentage yield based on weight of moisture-freed wood; viscosities expressed in centipoises in cuprammonium solution.)

Cellulosic materials	Holocellulose and pulps		Alpha-cellulose	
	Yield	Viscosity	Yield	Viscosity
(1) Holocellulose (prepared in 5-gram batches) and its alpha-cellulose	70.9	28.3	50.0	61.9
(2) Holocellulose (prepared in 1-pound batches) and its alpha-cellulose	68.0	40.4	52.0	48.8
(3) Unbleached pulp (prepared from (2)) and its alpha-cellulose	59.4	41.9	52.4	47.3
(4) Bleached pulp (prepared from (3)) and its alpha-cellulose	58.1	37.4	52.0	43.2

cosity of the two holocelluloses, the two pulps, and their alpha-celluloses.

Yields of Holocellulose and Pulp

The holocellulose prepared in five-gram batches constitutes all the holocellulose in the Asplund fiber. The yield, 70.9%, is about 2.9% higher than that of the holocellulose prepared in large batches, and 11.5 to 12.8% higher than that of the two pulps prepared from the holocellulose. As would be expected, the yield of bleached pulp is the smallest of the four cellulose materials.

Physical Properties

Table II contains values of the physical properites of the unbleached and the bleached pulps and of test sheets prepared from them.

Beating Time and Freeness

The unbleached pulp had an initial Schopper-Riegler freeness of 855 cc.; it lost its freeness gradually with processing time in a beater and still maintained a freeness of 430 cc. after processing for 70 minutes. The bleached pulp had an initial freeness of 870 cc.; it, too, lost its freeness gradually with time of processing, still having a freeness of 435 cc. after 100 minutes of processing. These results are uncommon for pulps constituting such high percentages of the wood. The general behavior for pulps of such high yields is to hydrate quickly to a freeness characteristic of pulps for glassine paper. The values of the two pulps are, however, comparable with those of bleached pulps suitable for making high grade papers.

Bursting Strength

The bursting strength of test sheets made from the unbeaten, unbleached pulp having a freeness of 855 cc. was 0.55 points per pound per ream; it was 1.51 points for the test sheets prepared from the pulp having a freeness of 430 cc. The corresponding value for the test sheets from the unbeaten, bleached pulp having a freeness of 870 cc. was 0.46 points per pound per ream, whereas that of sheets prepared from the pulp beaten 100 minutes and having a freeness of 435 cc. was 1.47 points per pound per ream. These values are considerably higher than corresponding values for a bleached sulphite pulp used for reference.

Tearing Strength

The tear values of test sheets made from the unbeaten, unbleached pulp having a freeness of 855 cc. was 2.94 grams per pound per ream; it gradually decreased with freeness to 1.30 grams per pound per ream for the test sheets made from the pulp having a freeness of 430 cc. Tearing values of test sheets made from the unbeaten, bleached pulp having a freeness of 870 cc. averaged 2.69 grams per pound per ream, whereas those for test sheets made from the pulp beaten for 100 minutes and having a freeness of 435 cc. averaged 1.24 grams per pound per ream.

Double Folds

Double-fold values averaged 158 for sheets made from the unbeaten, unbleached pulp. They reached a maximum of 2445 for the sheets made from the pulp having a freeness of 820 cc. and then decreased to 2012 double folds for sheets made from the pulp beaten 70 minutes and having a freeness of 430 cc. Double folds for test sheets prepared from the unbeaten, bleached pulp having a freeness of 870 cc. was 76; they reached 1579 double folds for sheets prepared from the pulp beaten for 100 minutes and having a freeness of 435 cc. In all cases the number of folds for the test sheets from the bleached pulp was lower than that for the corresponding sheets from the unbleached pulp.

Tensile Strength

The tensile strength value was 2680 pounds per square inch for sheets from the unbleached pulp having the freeness of 855 cc.; it was 11,300 pounds per square inch for sheets from the unbleached pulp with a freeness of 430 cc. The corresponding value was 2180 pounds per square inch for sheets from the bleached pulp having a freeness of 870 cc.; and it was 9500 pounds per square inch for sheets from the pulp having a freeness of 435 cc. In all cases the values for the sheets from the unbleached pulp were superior.

Stretch Values

Stretch values varied from 7% for the sheets from the unbleached unprocessed pulp to 7.5% for sheets from the pulp processed for 60 minutes. Stretch values varied from 5.75% for sheets from the unprocessed bleached pulp to 6.50% for sheets from the pulp processed for 40 and 100 minutes. In all cases the stretch was superior in the sheets from the unbleached pulp.

TABLE II.—BEATER TEST VALUES OF PULPS[1] AND OF TEST SHEETS

Pulps	Beating time, min.	Freeness S.R., cc.	Burst pts./lb./ream	Tear g./lb./ream	Double folds	Tensile lb. per sq. in.	Stretch %	Opacity %	Solid fraction
Unbleached pulp: Yield 59.4%; color 73 parts blue	0	855	0.55	2.94	158	2680	7.00	84.6	0.35
	20	820	1.17	1.82	2445	7320	7.50	81.5	0.46
	40	705	1.38	1.55	1893	8000	7.25	77.3	0.51
	50	615	1.43	1.35	1895	9450	7.25	72.6	0.53
	60	515	1.46	1.31	2110	9000	7.50	69.6	0.54
	70	430	1.51	1.30	2012	11300	7.25	67.8	0.56
Bleached pulp: Yield 58.1%; color 87 parts blue	0	870	0.46	2.69	76	2180	5.75	83.8	0.32
	20	830	0.93	2.39	1051	4600	6.00	83.0	0.39
	40	790	1.21	1.91	1397	6890	6.50	80.8	0.45
	60	705	1.35	1.57	1156	7850	6.25	73.8	0.47
	80	580	1.39	1.35	1272	8380	6.25	70.8	0.51
	100	435	1.47	1.24	1579	9500	6.50	70.3	0.52

[1] Pulps were prepared from white spruce holocellulose.

Viscosity of Holocelluloses and Pulps

The holocellulose prepared in small batches has the lowest viscosity (28.3 centipoises) of the four cellulose materials. It contains the highest percentage of homicelluloses, among which is a portion of low molecular weight materials, which would lower the viscosity. The hemicelluloses of low molecular weight were removed during the isolation of the one-pound batches of holocellulose. Their removal naturally increased the proportion of cellulosic material of high molecular weight in the holocellulose prepared in one-pound batches as is indicated by the viscosity (40.4 centipoises).

The viscosity of the unbleached pulp (41.9 centipoises) is only slightly higher than that of the one-pound batch holocellulose (40.4 centipoises). Removal of 11.5% of the hemicelluloses of low molecular weight during the preparation of the pulp should have raised the viscosity of the residual pulp considerably; apparently the effect of removing the material of low molecular weight was almost offset by degradation of the material of high molecular weight. Bleaching of the material for its conversion to the bleached pulp lowered the viscosity to 37.4 centipoises.

Yield of Alpha-Cellulose

The yield (50%) of alpha-cellulose from the holocellulose isolated in the five-gram batches is approximately 2.0% lower than that from each of the three other cellulose materials. Apparently, the hydrochloric acid formed on the fibers when the gaseous chlorine united with the lignin degraded the alpha-cellulose enough so that some of it dissolved in the 17.5% sodium hydroxide solution employed in its isolation. Yields of alpha-cellulose from the three remaining cellulosic materials were approximately 52% of the wood. These results indicate that the conversion of the holocellulose to pulp was made without sacrificing alpha-cellulose.

Viscosity of Alpha-Cellulose

The alpha-cellulose from the holocellulose prepared in five-gram batches had a viscosity of 61.9 centipoises, the highest value for the four alpha-celluloses even though 2% of the alpha-cellulose was degraded to the extent of being lost during the isolation of the holocellulose. The viscosity (48.8 centipoises) of the alpha-cellulose from the holocellulose prepared in one-pound batches was about 13 centipoises lower than that of the alpha-cellulose from the five-gram holocellulose. This finding can be explained on the basis of a degradation of the one-pound batch of holocellulose by the dilute acid solution formed during the chlorination of the wood suspended in water; the degradation appears to have shortened the long cellulose chains.

Viscosities of the alpha celluloses from the unbleached pulp average about the same as that of the alpha celluloses from the holocellulose prepared in one-pound batches. The viscosity of the alpha cellulose from the bleached pulp is only 4.0 centipoises lower than that of the alpha cellulose from the unbleached pulp, which indicates that only slight degradation was caused by the bleaching procedure.

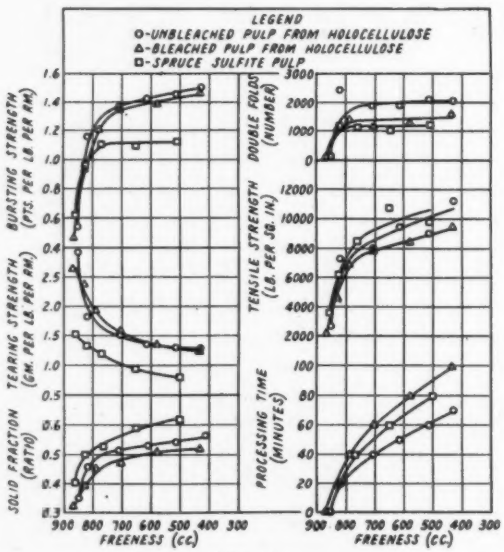

FIG. 1.
Beater Test Values of Pulps and Test Sheets

Opacity

The opacity ranged from 84.6% for sheets from the unprocessed unbleached pulp with a freeness of 855 cc. to 67.8% for sheets from the pulp processed for 70 minutes and having a freeness of 430 cc. Similarly, the opacity was 83.8% for sheets from the unprocessed bleached pulp and 70.3% for sheets from the pulp processed 100 minutes and having a freeness of 435 cc. The opacity of sheets from both pulps at zero and 20 minutes' beating are in good agreement with those of bleached commercial pulps for high grade papers.

Solid Fractions

The solid fraction values of the sheets from the unbleached pulp vary from 0.35 to 0.56; those of the sheets from the bleached pulp vary from 0.32 to 0.52.

Figure 1 shows graphically the physical properties of test sheets made from the unbleached, the bleached pulps, and from a white spruce sulphite pulp having good average strength properties for high grade papers. The freeness of the pulps is plotted against the strength properties of sheets made from them. It is thus possible to see at a glance the relative merits of the three papermaking materials. A consideration of the graphs and the two tables indicates, first, that the strength values of the sheets from the two pulps from holocellulose compare favorably with those of sheets from the commercial pulp; secondly, yields of the pulps are about 35% higher than those of the commercial pulp $[(58.1 - 43) \div 43 = 35\%]$; thirdly, yields of alpha-cellulose recoverable from the two pulps are approximately 37% higher than that from commercial pulps $[(52 - 38) \div 38 = 37\%]$.

Acknowledgment

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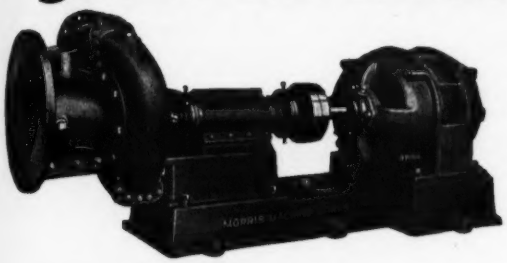

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NEW YORK IMPORTS

WEEK ENDING NOVEMBER 23, 1940

SUMMARY

Cigarette paper .....60 cs.
Newsprint .....7,991 rolls
Photo paper .....1 cs.
Miscellaneous paper .....6 bls., 39 cs.

CIGARETTE PAPER

E. F. Pipe & Co., ——, Bilbao, 60 cs.

NEWSPRINT

H. G. Craig Co., Inc., ——, Donnacona, 354 rolls.
International Paper Co., ——, Gatineau, 379 rolls.
H. G. Craig Co., Inc., ——, Donnacona, 357 rolls.
International Paper Co., ——, Gatineau, 385 rolls.
H. G. Craig Co., Inc., ——, Donnacona, 348 rolls.
——, ——, Liverpool, N. S., 6168 rolls.

PHOTO PAPER

J. E. Bernard & Co., ——, Lisbon, 1 cs.

MISCELLANEOUS PAPER

Pan Pacific Importers, ——, Yokohama, 6 bls.
National City Bank, ——, Kobe, 39 cs.

RAGS, BAGGINGS, ETC.

Irving Trust Co., ——, Shanghai, 100 bls. cotton waste.
Pan American Trust Co., ——, Shanghai, 300 bls. cotton waste.
Manufacturers Trust Co., ——, Shanghai, 600 bls. cotton waste.
Chemical Bank Trust Co., ——, Shanghai, 100 bls. cotton waste.
——, ——, Shanghai, 175 bls. cotton waste.
——, ——, Vera Cruz, 36 pkgs. waste paper.
O'Brien Products Co., ——, Shanghai, 150 bls. picker waste, 100 bls. cotton waste.
Padawer & Co., ——, Shanghai, 180 bls. cotton waste.
Green Textile Associates, Inc., ——, Shanghai, 100 bls. picker waste, 100 bls. cotton fly waste.
——, ——, Kobe, 400 bls. bagging waste.
Joe Levy & Son, ——, Havana, 20 bls., 11 bags rags.

GLUE STOCK

Darmstadt, Scott & Courtney, ——, Shanghai, 16 bls.

OLD ROPE

——, ——, Cristobal, 3 bls.

BOSTON IMPORTS

WEEK ENDING NOVEMBER 23, 1940

E. C. Andres, ——, Shanghai, 100 bls. cotton waste.

BALTIMORE IMPORTS

WEEK ENDING NOVEMBER 23, 1940

American Cyanamid & Chemical Corp., ——, Buenos Aires, 1667 bags casein, 100020 kilos.

LOS ANGELES IMPORTS

WEEK ENDING NOVEMBER 23, 1940

——, ——, Powell River, 2712 pkgs. newsprint.
——, ——, Osaka, 4 cs. tissue paper.
——, ——, Tokio, 1 cs. writing paper.

Gummed Industries Meet

At the annual convention of the Gummed Industries Association held in Cleveland, Ohio, on November 11 and 12, Fred A. Stocker of the Atlantic Gummed Paper Corporation of Brooklyn, N. Y. was elected president of the association, and R. S. Rowlett of the McLaurin-Jones Company of Brookfield, Mass., was elected vice-president. Philip O. Deitsch, managing director of the Gummed Industries Association, was re-elected secretary-treasurer. All of these officers will serve until the next annual meeting of the association, which will be held in 1941 during the month of November.

The selection of Mr. Rowlett as vice-president of the association is an expression of recognition on the part of the industry for the valuable and constructive service he has rendered to the organized efforts of the Industry in the past. He will be of no little help to President Stark and the present Management of the Association in carrying forward in an even more aggressive manner than in the past the policies of operation of the group, which in the main are predicated upon the sound principle of honest and straightforward service of both product and man power to that part of the buying public the Industry is called upon to supply.

The Gummed Industries Association is inaugurating a sustained effort for greater cooperation on the part of all producing units of the Industry as its material contribution to the speeding up of the defense program of our country. Its work with the United States Bureau of Standards, the Association of American Railroads, the Railway Express Agency, the Post Office Department, various testing laboratories and other agencies, shall continue without interruption.

Announcement of the appointment of several functional committees under whose guidance the various programs now under way shall be administered will be made in due course.

The Gummed Industries Association does not plan to hold any group meetings during Paper Week in New York this year, believing that it is only right and proper that its members be released for attention to more important customer contacts during that highly active week.

Other officers elected to the Board of Directors at the Annual Convention of The Gummed Industries Association were—James R. Carter, Nashua Gummed and Coated Paper Company; A. S. Hammond, Western Waxed Paper Company; Irving McHenry, Mid-States Gummed Paper Company; Joseph Mazer, Hudson Pulp and Paper Corporation; H. W. Stark, Rexford Paper Company.

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COMPETENT TECHNICIANS
IMMEDIATELY AVAILABLE
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These features you find in Appleton Felts—and more. They are designed to meet your mill requirements, applying all the technical skill, plant control, knowledge and experience of over half a century. Submit your felt problems to us.

APPLETON WOOLEN MILLS
APPLETON, WISCONSIN

make
APPLETON FELTS
good paper

New York Paper and Pulp Market Review

Kraft Paper Production Continues At High Level But Below Record Volume of Last Year With Merchant Inventories Reported Higher Than Year Ago—Pulp Market Quiet—Paper Market Firm.

Office of the PAPER TRADE JOURNAL,
Wednesday, November 27, 1940.

Sales volume in the wholesale paper market continues to be maintained at a moderately good level. Reports from many manufacturers' representatives, jobbers, and general paper merchants during the week indicate volume is substantially below the record high volume of last year.

The index of general business activity for the week ended November 16 declined to 109.9 per cent, from 111.5 per cent for the previous week, compared with 106.1 per cent for the corresponding week last year.

Business activity, measured by check payments reported by the Federal Reserve System for October, 1940, was 11.7 per cent higher than for the same month last year, while sales volume was 13.4 per cent higher.

Paper production for the week ended November 16 was estimated at 89.0 per cent, compared with 98.4 per cent for 1939, with 80.6 per cent for 1938, with 62.5 per cent for 1937, and with 89.4 per cent for the corresponding period for 1936.

Paper board production for the week ended November 16 was 77.0 per cent, compared with 83.0 per cent for 1939, with 67.0 per cent for 1938, with 56.0 per cent for 1937, and with 80.0 per cent for the like period for 1936.

Reports received during the current week are somewhat diverse in the opinions expressed on prospects for the immediate future. The consensus of the opinion seems to reflect the belief that the demand for most grades of paper will continue steady, with no substantial increase in volume until after the new year, excepting in those lines in the classification of holiday goods.

Paper prices, in general, are well maintained and the market is stable under a moderate to good demand for many standard grades. No important price changes have been reported during the week. From late reports received commenting on discounts below prevailing representative quoted market prices, this practice is apparently very limited at this date.

Kraft paper continues active, with most mills reporting production at a high level. This is the normal seasonal trend prior to Christmas. Merchant stocks are reported higher than at this period last year.

Mechanical Pulp

The mechanical pulp market is a little quiet at this date. Prices continue unchanged. No substantial change in demand or prices is expected in the trade in the near future, as the few weeks before Christmas are normally seasonally quiet. Prospects continue good.

Chemical Pulp

No important change in chemical pulp has been reported this week. The outlook for domestic and Canadian producers continues excellent and a steadily increasing production of domestic and Canadian chemical wood pulp is looked for in the trade. Prices are unchanged.

Rags

Mill buying of rags continues steady and for immediate needs with no important forward buying reported. Demand is narrow and largely represented by the higher grades. Prices hold unchanged, with the exception of new white No. 1 shirt cuttings, which are lower this week, under the influence of larger supplies, and currently quoted at from 6.50 to 6.75. New unbleached rags are also lower and currently quoted at from 6.25 to 6.50.

Old Rope and Bagging

Small supplies of Manila rope have restricted trading in the old rope market which, due to the same basic cause, is very firm at this date. No change in prices on any grades of rope has been reported this week.

The old bagging market is very firm, under the influence of limited supplies, reported inadequate to meet current inquiries. Prices hold unchanged on all grades, with quotations on foreign gunny and roofing bagging continuing nominal.

Old Waste Paper

Paper stock in the lower grades is moving steadily in good volume under active mill buying and reports indicate no considerable stocks are being accumulated at this date. Higher grades of old waste paper are rather quiet. No important change from prevailing representative market quotations has been reported this week.

No change of importance in the wholesale twine market is reflected in reports received this week. Prices hold unchanged on all standard grades of hard and soft fiber twines. Prospects continue good.

Waste Material Men To Meet

An important meeting to which are invited all members of the Waste Material Trade interested in Cotton Cuttings is to be held at the headquarters of the National Association of Waste Material Dealers, Inc., 1109 Times Building, New York, at 2 P. M., on Wednesday, December 4.

This meeting is being arranged by the committee which has been protesting a subsidy by the Department of Agriculture on an additional 10,000 bales of cotton for the Writing Paper Manufacturing Industry. It is being held in advance of a conference to be held by committees representing the National Association of Waste Material Dealers, Inc., and the Writing Paper Manufacturers Association.

All interested dealers whether members of the Association or not are urged to attend. It is particularly requested, however, that all those planning to attend notify the secretary promptly on receipt of the notice of the meeting.

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THAT Warren pumps are "built to fit the job" is a fact, not a claim. Its proof rests in hundreds of successful Warren pump installations in the paper industry. To you as a pump buyer, it means that Warren engineers recommend only pumps they know will meet specific operating requirements and provide unfailing service at consistently low operating costs. . . . If you would like proof of this statement as applied to your pump requirements and operating costs, we invite you to bring your problems to Warren.

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WATCH FOR ANNOUNCEMENT ON TRIMBEY-WALKER WHIRLPOOL RIFFLER

MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL,
Wednesday, November 27, 1940.

BLANC FIXE—Prices on blanc fixe are firm and unchanged and conform to prevailing market levels. The pulp is currently quoted at $35 per ton, in barrels, at works; the powder is currently quoted at $50 per ton, f.o.b., works. Demand reported moderate for the week.

BLEACHING POWDER—Quotations on bleaching powder are firm. Demand reported moderate for the week. Bleaching powder is currently quoted at $2 per 100 pounds, in drums, at works.

CASEIN—Prices on casein are firm, with prices little changed for the current week. Standard domestic casein, 20-30 mesh, is currently quoted at 12 cents per pound; 80-100 mesh, at 12½ cents per pound. All prices in bags, car lots. Argentina casein, 20-30 mesh, is currently offered at 12 cents per pound. No quotations on French casein.

CAUSTIC SODA—Quotations on caustic soda are firm and continue unchanged at prevailing market prices. Shipments reported steady. Solid caustic soda is currently quoted at $2.30 per 100-pounds; flake and ground at $2.70 per 100 pounds, in drums, at works.

CHINA CLAY—Prices on china clay are firm and conform to prevailing market levels. Demand reported moderate at this date. Domestic filler clay is currently quoted at from $7 to $15 per ton; coating clay at from $11 to $22 per ton, at mines. Imported clay is currently offered at from $13 to $25 per ton, ship side.

CHLORINE—quotations on chlorine are firm and unchanged. Market strong. Demand reported good for the current week. Chlorine is currently quoted at $1.75 per 100 pounds, in single-unit tank cars, f.o.b., works.

ROSIN—The rosin market is reported firm for the week with prices a little lower. "G" gum rosin is currently quoted at $1.87 per 100 pounds, in barrels, Savannah "FF" wood rosin is currently quoted at $1.87 per 100 pounds, in barrels, New York. Seventy per cent gum rosin size is quoted at $2.55 per 100 pounds, f.o.b., works.

SALT CAKE—Prices on salt cake are firm and nominal. Demand good. Domestic salt cake is currently quoted at $17 per ton, in bulk; chrome cake at $16 per ton. All prices in car lots, f.o.b., shipping point. The quotation of $20 per ton on imported salt cake is nominal.

SODA ASH—Quotations on soda ash are firm and continue to conform to prevailing market levels. Demand reported moderate for the week. Prices on soda ash in car lots, per 100 pounds, are as follows: in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Prices on corn starch are firm and continue unchanged for the current week. Pearl is currently quoted at $2.90 per 100 pounds; powdered starch at $3 per 100 pounds. All prices in bags, car lots, f.o.b., Chicago.

SULPHATE OF ALUMINA—Quotations on sulphate of alumina are firm. Demand reported moderate for the current week. The commercial grades are currently quoted at $1.15; iron free at $1.60 per 100 pounds. All prices in bags, car lots, f.o.b., works.

SULPHUR—Prices on sulphur are firm and conform to prevailing market levels. Annual contracts are currently quoted at $16 per long ton, f.o.b., mines. Spot and nearby car lots are quoted at $19 per ton.

TALC—Quotations on talc are firm and continue unchanged at prevailing market prices. Domestic talc is currently quoted at from $15 to $21 per ton, at mines. Quotations on imported talc are nominal.

MARKET QUOTATIONS

Paper

(Delivered New York)

News, per ton—			
Roll, contract	$50.00	@	—
Sheets	58.00	"	—
Kraft—per cwt.—Delivered Zone A			
Northern, Extra Quality	$5.25	@	$5.75
Superstandard	4.87½	"	5.25
Northern Standard Wrapping	4.37½	"	4.62½
Standard Wrapping	4.25	"	—
Tissues—Per Ream—Carlots			
White No. 1	.97½	"	—
White No. 1 M. G.	.95	"	—
White No. 1½	.80	"	—
White No. 2	.75	"	—
Anti-Tarnish M. G.	.80	"	—
Colored	.85	"	—
Kraft	.87½	"	—
Manila	.77½	"	—
Unbl. Toilet, 1 M.	3.75	"	—
Bleached Toilet	5.26	"	—
Paper Towels, Per Case—			
Unbleached, Jr.	2.10	"	—
Bleached, Jr.	3.60	"	—
Manila—per cwt.—C. l. l. a.			
No. 1 Jute	8.25	@	10.35
No. 1 Manila Wrapping, 35 lb.	5.25	"	—
No. 2 Manila Wrapping, 35 lb.	5.00	"	—
Boards, per ton—			
News	35.00	@	40.00
Chip	35.00	"	40.00
Sgl. Mla. l.l. Chip	55.00	"	57.00
White Pat. Coated	67.00	"	70.00
Kraft Liners	55.00	"	—
Binders Boards	73.00	"	80.00

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds		Ledgers
100% Rag Ext. No. 1	$39.10 @ $46.00		$40.25 @ $47.25
100% Rag	31.05 " 36.50		32.20 " 37.75
85% Rag	.... "		29.90 " 35.00
75% Rag	23.60 " 27.75		24.75 " 29.00
65% Rag	.... "		21.65 " 26.25
50% Rag	17.55 " 21.50		18.70 " 22.75
25% Rag	14.65 " 17.75		15.80 " 19.25

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
No. 1	$9.35 @ $11.50	$11.55 @ $12.75
No. 2	8.50 " 10.25	9.65 " 11.75
No. 3	8.05 " 9.25	9.20 " 11.25
No. 4	7.70 " 9.50	8.90 " 10.75

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper, Delivered in Zone 1:

No. 1 Glossy Coated	$11.90	@	$13.50
No. 2 Glossy Coated	10.35	"	11.75
No. 3 Glossy Coated	9.55	"	11.00
No. 4 Glossy Coated	9.15	"	10.50
No. 1 Antique (watermarked)	9.05	"	$10.50
No. 2 Offset	8.40	"	9.75
A Grade E. F.	8.20	"	9.50
A Grade S. & S. C.	8.45	"	9.75
B Grade E. F.	7.65	"	8.75
B Grade S. & S. C.	7.90	"	9.00
C Grade E. F.	7.35	"	8.50
C Grade S. & S. C.	7.60	"	8.75
D Grade E. F.	7.10	"	8.25
D Grade S. & S. C.	7.35	"	8.50

Ivory & India at 8.50 cwt. extra.

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	No prices		
Dry	No prices		
(Delivered)			
No. 1 Domestic and Canadian	40.00	@	42.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Prime Bleached Sulphite	3.72½	@	3.87½
Prime Qualities—			
Easy-Bleaching Sulphite	3.17½	"	3.75
Strong Unbleached Sulphite	3.17½	"	3.75
News Grade, delivered Unbleached Sulphite	58.00	"	61.50
(On Dock, Atlantic Ports)			
Kraft Bleached	4.12½	"	
Kraft Light & Strong	3.50	"	3.75
Kraft No. 1	3.40	"	3.60
(F. o. b. Pulp Mill)			
Kraft Domestic and Canadian	2.75	"	3.37½
(Delivered)			
Soda Bleached	3.30	"	—

Add 60 cents per short ton, dock charges for Albany; $2.50 for Lake Ports East and $3.50 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.

Shirt Cuttings—			
New White, No. 1	6.50	@	6.75
Silesias No. 1	4.50	"	4.65
New Unbleached	6.25	"	6.50
Blue Overall	4.35	"	4.50
Fancy	3.25	"	3.50
Washables	2.00	"	2.10
Mixed Khaki Cuttings	2.75	"	3.00
O. D. Khaki Cuttings	3.00	"	3.15

Old Rags

White, No. 1—			
Repacked	3.50	"	3.63
Miscellaneous	2.75	"	3.00
White, No. 2—			
Repacked	2.50	"	2.75
Miscellaneous	2.00	"	2.25
Thirds and Blues—			
Repacked	1.50	"	1.65
Miscellaneous	1.10	"	1.25
Roofing Rags—			
No. 1	1.00	"	1.10
No. 2	1.00	"	1.05
No. 3 (bagging)	.90	"	1.00
No. 4	.60	"	.65
No. 5A	.60	"	.65

Foreign Rags

All prices nominal

New Rags

New Dark Cuttings	2.25	@	2.40
New Mixed Cuttings	2.00	"	2.20
New Light Silesias	5.50	"	5.75
Light Flannelettes	5.50	"	5.75
New White Cuttings	7.00	"	7.50
New Light Oxford	4.00	"	4.50
New Light Prints	3.00	"	3.25

Old Rags

No. 1 White Linens	7.50	"	8.50
No. 2 White Linens	6.50	"	7.50
No. 3 White Linens	4.50	"	—

"NON-USERS ARE THE LOSERS"

TENAX FELTS

FINISH AND TRIM

Time NOW To Renew!

We must look ahead. While we view this year's results with satisfaction, we cannot rest content. Let's make the most of present conditions and equip to take advantage of future opportunities.

Specify TENAX FELTS for new machines, and meantime clothe old machines with new TENAX FELTS.

"Non-Users Are The Losers"

LOCKPORT FELT COMPANY

NEWFANE, N. Y.–U. S. A.

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SHORT CUT to FACTS
Everyone knows the South possesses outstanding advantages for manufacturing. However, not all communities in the South offer equal advantages to industry. In the six Southeastern States served by the Seaboard, as elsewhere, a plant location is good or bad depending upon whether it meets the requirements of the enterprise.
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For many years we have made a careful study of this territory, and accumulated a great amount of information on plant sites, natural resources and manufacturing conditions. To responsible clients we offer an experienced and competent plant location service without cost or obligation.
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SEABOARD
AIR LINE RAILWAY

No. 4 White Linens.	2.25	@	3.25
No. 1 White Cotton.	4.25	"	4.75
No. 2 White Cotton.	3.25	"	3.75
No. 3 White Cotton.	2.50	"	3.00
No. 4 White Cotton.	1.90	"	2.20
Extra Light Prints..	2.00	"	2.40
Ord. Light Prints...	1.75	"	2.15
Med. Light Prints...	1.55	"	1.95
Dutch Blue Cottons.	2.25	"	2.50
French Blue Linens.	3.00	"	—
Checks and Blues...	2.00	"	—
Linsey Garments....	1.90	"	2.00
Dark Cottons.....	1.50	"	1.60
Old Shopperies.....	1.30	"	1.45
New Shopperies.....	1.45	"	1.50
French Blues.....	2.25	"	2.50

Old Rope and Bagging

(Prices to Mill, f. o .b. N. Y.)

Gunny No. 1—			
Foreign	Nominal		
Domestic	2.50	"	2.75
Wool Tares, light...	2.00	"	2.25
Wool Tares, heavy..	2.12½	"	2.25
Bright Bagging	2.25	"	2.50
Manila Rope—			
Foreign	4.75	"	5.00
Domestic	4.50	"	4.75
Jute Threads.....	2.62½	"	2.75
Sisal Strings.....	2.10	"	2.35
Mixed Strings.....	1.10	"	1.20

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	3.10	@	3.25
Ordinary Hard White No. 1....	2.25	"	2.50
Soft White No. 1..	1.80	"	1.90
Soft White Extra..	2.50	"	2.60
Flat Stock—			
Stitchless	1.10	"	1.25
Overissue Mag.....	.90	"	1.00
Solid Flat Book....	.80	"	.85
Crumbled No. 1....	.70	"	.75
Ledger White Stock.	1.70	"	1.75
Ledger Stock Colored	1.30	"	1.40
Manila—			
New Env. Cut....	1.70	"	1.80
New Cuttings.....	1.30	"	1.40
Old Kraft Machine Compressed bales..	1.40	"	1.50
News—			
No. 1 White News	1.75	"	1.90
Strictly Overissue.	.70	"	.75
Strictly Folded....	.45	"	.55
Corrugated	.65	"	.67½
No. 1 Mixed Paper..	.32½	"	.35

Twines

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.18	@	—
White Hemp.....	.18	"	—
Fine Polished—			
Fine India.....	.22	"	—
Unpolished—			
Box	.16	"	—
Paper Makers.....	.13	"	—
Tube Rope.....	.14¾	"	—
Wall Paper.....	.16	"	—
Wrapping	.16	"	—
Soft Fiber Rope...	.14	"	—
Cotton	.24	"	—
(Hard Fiber)			
Medium Java.....	.10	"	—
Mex. Sisal.....	.09½	"	—
Manila	.23	"	—

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f.o.b. Phila.)

Shirt Cuttings—			
New White No. 1.	.06½	@	.07
New White No. 2.	.03½	"	.04
Light Silesias.....	—	"	.04½
Silesias, No. 1....	—	"	.04
Black Silesias, soft	—	"	.03
New Unbleached...	.06	"	.06¼
Washable Prints...	.02¼	"	.02½
Washable, No. 1..	—	"	.01½
Blue Overall.....	.04	"	.04½
Cottons—According to grades—			
Washable shredding	—	"	.01½
Fancy Percales....	—	"	.03
New Black Soft...	.02½	"	.02¾
New Light Seconds	—	"	.04
New Dark Seconds	—	"	1.50
Khaki Cuttings—			
No. 1 O. D.....	.03½	"	.03¾
No. 2 Mixed.....	.01¾	"	.02
Corduroy	.01¼	"	.01½
New Canvas.....	.04½	"	.05
New Black Mixed.	—	"	.02¼

Domestic Rags (Old)

White No. 1—			
Repacked	3.00	@	3.50
Miscellaneous	2.75	"	3.00
Thirds and Blues—			
Miscellaneous	1.35	"	1.50
Repacked	1.55	"	1.65
Black Stockings (Export)	3.50	"	4.00
Roofing Stock—			
Foreign No. 1....Nominal			
Domestic No. 1...	1.10	"	1.15
Domestic No. 2...	.95	"	1.00
Roofing Bagging..	.85	"	.90

Bagging

(f.o.b. Phila.)

Gunny, No. 1—			
Foreign .....Nominal			
Domestic	2.25	@	2.50
Manila Rope.....	—	"	5.00
Sisal Rope.....	2.00	"	2.25
Mixed Rope.....	.75	"	1.00
Scrap—			
No. 1.....	2.25	"	2.50
No. 2.....	—	"	1.50
Wool Tares, heavy..	3.75	"	4.00
New Light Burlap	3.00	"	4.00
New Burlap Cuttings	2.25	"	2.50

Old Papers

(f.o.b. Phila.)

Shavings—			
No. 1 Hard White	2.40	@	2.50
No. 2 Hard White	2.10	"	2.15
No. 1 Soft White	2.00	"	2.10
No. 2 Soft White	1.60	"	1.75
No. 1 Mixed.....	.90	"	1.00
Solid Ledger Stock..	1.90	"	2.00
Ledger Stock, white.	1.65	"	1.70
Ledger Stock, colored	1.20	"	1.25
No. 1 Books, heavy..	.80	"	.85
Manila Cuttings.....	1.75	"	1.80
Print Manila.....	.50	"	.55
Container Manila....	.45	"	.50
Kraft Paper.....	1.30	"	1.35
No. 1 Mixed Paper..	.30	"	.35
Straw Board Chip...	.30	"	.35
Binders Board Chip..	.30	"	.35
Corrugated Board...	.60	"	.65
Overissue News.....	.70	"	.75
Old Newspapers.....	.50	"	.55

BOSTON

Old Papers

(f.o.b. Boston)

Shavings—			
No. 1 Hard White	2.75	@	3.00
No. 1 Soft White	2.00	"	2.25
No. 2 Mixed.....	.75	"	.80
Solid Ledger Books..	1.50	"	1.75
Overissue Ledger Stock	1.75	"	2.00
Mixed Ledgers.....	1.50	"	1.75
No. 1 Heavy Books	1.10	"	1.20
No. 1 Books, Light..	.75	"	.85
Crumpled Stitchless Book Stock.....	.75	"	.85
Manila Env. Cuttings	1.85	"	2.00
Manila Envelope Cuttings extra quality	2.35	"	2.60
White Blank News..	1.40	@	1.50
No. 1 Kraft.....	1.25	"	1.30
Extra No. 1 Kraft...	1.00	"	1.65
Mixed Papers.....			
Print Manila.....	.55	"	.60
Container Manila...	.60	"	.70
Old Newspapers.....	.50	"	.55
Paper Wool Strings.	.95	"	1.10
Overissue News.....	1.00	"	1.10
Box Board Chips....	.40	"	.45
Corrugated Boxes...	.60	"	.65
Kraft Cerrugated Boxes	1.00	"	1.05
New Kraft Corrugated Cuttings	1.45	"	1.60
Screening Wrappers.	.70	"	.80

Bagging

(f.o.b. Boston)

Gunny Bagging—			
Foreign	2.60	"	—
Domestic	2.25	"	2.40
Sisal Rope.....	2.25	"	2.50
Mixed Rope.....	.85	"	1.00
Transmission Rope—			
Foreign	—	"	2.40
Domestic	2.00	"	2.25
Soft Jute Rope.....	3.25	"	3.50
Manila Rope—			
Foreign	5.00	"	5.25
Domestic	4.75	"	5.00
Jute Carpet Threads	2.00	"	2.25
Bleachery Burlap....	4.00	"	4.25
Scrap Burlap—			
Foreign	2.35	"	2.50
Domestic	2.15	"	2.35
Scrap Sisal.....	2.25	"	2.50
Scrap Sisal for Shredding	2.30	"	2.65
Wool Tares—			
Foreign, Heavy...	2.40	"	2.50
Domestic	2.40	"	2.50
Aust. Wool Pouches.	2.75	"	3.00
New Burlap Cuttings	3.75	"	4.00
Heavy baling bagging	2.75	"	3.00
Paper Mill Bagging..	1.75	"	2.00
No. 2 Bagging.....	.75	"	.80

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints.	—	@	.03
Fancy Percales....	.04	"	.04½
New White No. 1.	.07	"	.07¼
New Light Flannelettes	.05	"	.05¼
Canton Flannel, Bleached	.07	"	—
Underwear Cutters, Bleached	—	"	.07
Silesias No. 1	.05	"	—
New Black Silesias..	3.00	"	3.25
Red Cotton Cuttings	.04	"	.05
Soft Unbleached...	.07	"	.07½
Blue Cheviots.....	.05	"	.05½
Fancy	.02	"	.02½
Washable	.02	"	.02½
Cottons—According to Grades—			
Blue Overalls.....	.04¾	"	.03
New Black Soft	.03	"	.03½
Khaki Cuttings....	.02½	"	.03
O. D. Khaki.....	.02½	"	.03¼
Corduroy	.02¾	"	—
New Canvas.....	.06¼	"	.07
B. V. D. Cuttings...	.07	"	.07½

Domestic Rags (Old)

(F. o.b. Boston)

White No. 1—			
Repacked	2.75	"	1.75
Miscellaneous	2.40	"	2.60
White No. 2—			
Repacked	1.90	"	2.00
Miscellaneous	2.00	"	2.25
Twos and Blues.....	2.00	"	2.25
Old Blue Overalls ..	.60	"	—
Thirds and Blues—	1.50	"	1.75
Miscellaneous	1.25	"	1.35
Black Stockings.....	3.50	"	4.00
Roofing Stock—			
No. 1.....	1.20	"	1.30
No. 2.....	.95	"	1.00
No. 3.....	.85	"	.95

Foreign Rags

(F. o. b. Boston)

Canvas	.04¼	@	—
Dark Cottons.....	(nominal)		
Dutch Blues.....	(nominal)		
New Checks and Blues	(nominal)		
Old Fustians.....	(nominal)		
Old Linsey Garments.	(nominal)		
New Silesias.....	(nominal)		

CHICAGO

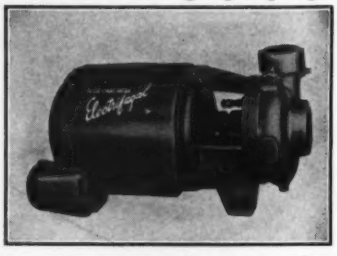
Waste Paper

(f.o.b. Chicago)

Shavings—			
No. 1 White Envelope cuttings....	3.15	@	—
No. 1 Hard White	2.50	"	2.65
No. 1 Soft White.	2.00	"	2.20
Ledger and Writings	.85	"	.95
Solid Books.....	.95	"	1.10
Blanks	1.50	"	1.60
Kraffs	1.40	"	1.50
New Kraft Cuts.....	1.60	"	1.75
Overissue News.....	1.00	"	1.10
Old Newspapers—			
No. 1 Folded News	.70	"	.80
No. 1 Mixed Paper	.40	"	.50
Roofing Stocks—			
No. 1.....	.95	@	1.00
No. 2.....	.85	"	.90

New Electrical Pump

The Allis-Chalmers Manufacturing Company, Milwaukee, Wis., announces its new "Electricfugal" pump which is an all-in-one centrifugal pump especially designed as a complete pump and motor unit on one shaft and one housing. Instead of using standard motors having special end housings and shaft extensions, the "Electrifugal" pumping unit has a special motor with a one piece cast iron motor yoke and pump bracket. The feet are cast integral with the housing and bracket and extend under the entire unit instead of under the motor only.



The special motor design, with copper bearing steel cover, meets NEMA specifications for splash proof motors.

In splash proof construction the "Electrifugal" pump is now available in sizes from 1 hp to 10 hp inclusive at 3500 rpm and from ¾ hp to 7½ hp inclusive at 1750 rpm for heads up to 160 feet. Larger sizes of this type are in the process of design.

For normal service the pump is built with cast iron casing, bronze fitted. It can, however, be made all iron, all bronze, all stainless steel, or of other special metals to suit any industry. In the chemical industry the sheet metal motor cover can be made of stainless steel to provide the longest possible complete unit life on any particular installation. Bulletin B-6040 is available on request.

Section II
of
PAPER TRADE JOURNAL
November 28, 1940

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FOREWORD

In 1690, nearly a century before this country came into being as an independent nation, William Rittenhouse and three associates, Robert Turner, Thomas Tresse and Samuel C. Carpenter founded and operated the first paper mill established in the Americas and the location was in what is now Fairmount Park, Philadelphia, Pa.

In 1940, 250 years later, there are now operating in the United States alone 985 mills owned by 535 concerns. Each of these mills is immeasurably larger in production tonnage, and also in the variety and purposes of the paper produced by them, than the original Rittenhouse Mill.

At this writing, paper production is at its peak in variety, quantity, and quality of product and in the number of executive officers and owners of these producing mills and in the number of men employed therein and thereby.

Chemistry and machine builders have kept pace with the requirements of the enlargement of the demand, both in quantity and variety and have done their part and made possible the development of the industry and the variety of its product.

Paper is such a common thing that it is just "taken for granted." Few realize its tremendous importance to humanity.

PAPER IS THE MOST USEFUL AND MOST USED PRODUCT OF MAN. There is only one other identifiable thing in equally common use and that is fresh water and that is not a product of man.

The variety of kinds and purposes of paper and paper products is so large and diversified that it is not possible to identify and record them individually herein. Suffice it to say that every act of civilized life entails the use of paper. All our records thereof, all our recorded history, all our recorded religions, all our evidence and proof of ownership of property or possessions, proof of birth, proof of citizenship, proof of death, bonds and mortgages and shares of stock, our deeds, etc., ad infinitum, are recorded on pieces of paper—our money itself is just paper—all our taxes are paid with pieces of paper, and so I say and claim that paper is the most useful and most used product of man and that the men who make it are all, each and every one of them undeniably USEFUL MEN.

PAPER TRADE JOURNAL presents in the following pages the record of 250 Years of Paper Making in America. No other periodical has ever attempted to publish in one of its regular issues the story and history of any of our major industries from the very birth thereof right down to the present. We include the complete roster, name by name, of all of our paper manufacturing concerns and the men that own and operate them.

PAPER TRADE JOURNAL does this same thing in identifying by name the men that joined with Rittenhouse in 1690. There were only four. Today in this issue we identify all the operating mills in this country and name 2000 useful men operating these mills. You can add to that number the many thousands of employees of these 985 mills and put each one of them on an honor roll of useful men, producers of mankind's most useful and most used product.

Geo. S. Macdonald

President Lockwood Trade Journal Co.
and Publisher of Paper Trade Journal

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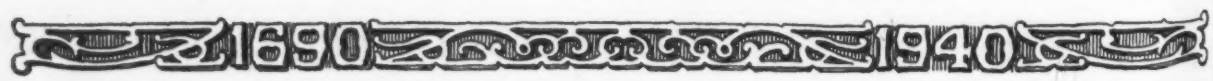


250 YEARS

of

Paper Making In America

A History of the Industry from the Times of William Rittenhouse

By a Member of the Staff of the Paper Trade Journal

CHAPTER I

The Industry In Its Infant Stages

THE manufacture of paper was established in the United States in September, 1690. That was two and a half centuries ago. Beginning with a small mill which made paper from linen rags, the industry has grown to such large dimensions that today it ranks high among our industries and it is continually expanding. The value of the annual production of paper and paper products is now over a billion dollars. These products form the basis of the printing, lithographing, newspaper and many other industries yielding annually wealth of many billions and giving employment to hundreds of thousands of men and women.

Like most pioneering work, the development of the paper industries was slow and called for much tenacity on the part of the founders. Their struggles form romantic chapters of great interest.

Intellectual pursuits claimed the attention of few of the early colonists of the United States. They spent their days in physical labor clearing the land, hunting, fishing, trapping or cultivating the soil. They were compelled to exert their energies in catering to human wants—provided shelter, food, protection and clothes. Under these conditions there was no demand for the local printing of newspapers and books. Those who wanted such things could import them from Europe. Although some of the colonists had experience in European paper mills and they found abundant water power in the colonies, the entire lack of demand for paper caused them to follow other pursuits.

The demand for metals, bricks, terra cotta and other materials developed before the want of locally manufactured paper was felt. Iron ores were found in Virginia, Tennessee, Georgia, Massachusetts, New Jersey and elsewhere and small smelters were built in these states to manufacture iron. Lead, zinc and copper smelters were developed later. The articles made from these metals were of service to the physical wants of man. They helped in making farm machinery, wagons, stoves, tanks and a multitude of common objects. They are always the first basic materials new social units engage in manufacturing. Paper at least in the early years of a country's development, ca-

THE THIRD RITTENHOUSE MILL, BUILT PRIOR TO 1770.

ters to intellectual development. Even in large enlightened settlements these characteristics of metals and paper are found to develop similarily. Today the metal industries attract more attention and are more widespread than the paper industries. But there may be a change in the future. Some enthusiastic paper men are today dreaming of a paper age. Pointing to the growing increase of the use of paper and pulp in the arts they say: "Can we not legitimately visualize a time when we shall be dressed in paper clothing, sit on paper chairs around a paper table, drink tea and coffee from paper cups, use paper knives, forks and spoons, walk on paper floors, stairs and sidewalks and ride in paper cars and automobiles?" These are not extravagant dreams. They could be supplied to us today should we desire them. Many such articles are made now.

The First Newspapers

The first newspapers published in the United States appeared in 1700. A printers press was in operation in Boston in 1638. Just before 1700, pamphlets were printed in New York City, Philadelphia and Boston. It was a short step from pamphlets to books, although for many years after 1700 most of the books read in America were imported from Europe. The feeding of the intellect is always subsidiary to the feeding of the physical body. This is one of the lessons we learn from the history of the establishment of paper manufacture in America. Spiritual food follows the physical and paper's great service will be rendered when it caters to both the physical and intellectual man.

A suburb of Philadelphia was the cradle of the great paper industries in America. Twenty acres of land were leased by a syndicate of Philadelphia business men in September, 1690, just two hundred and fifty years ago. These pioneers were William Bradford, printer; Thomas Tresse; Robert Turner, real estate dealer; and Wilhelm Rittershausen, who changed his name to William Rittenhouse. The site of their first paper mill was Wissahickon Creek at a point about two miles above the junction of the Wissahickon with the Schuylkill River.

Bradford, the Promoter

Bradford was the promotor of the paper industry. He left London to establish a printing and publishing business in Philadelphia. He was a forceful character in addition to being a good scholar and printer. He published Kalendarium Pennsylvaniense, his first book one of the first books published in the United States.

Rittenhouse was the practical paper-maker. He came from a paper-making family that had been settled long in Mulheim, Germany. When in 1678 he took the oath of Dutch citizenship in Amsterdam he described himself as "Willem Ruddinghuysen van Mulheim, papermaker". Taking a new citizenship enabled him to aggrandize his name and calling. He was more than a gentleman papermaker. He was a clergyman in the Mennonite sect and became the builder of and the first minister of the Mennonite church in Germantown, Pa.

The mill was small and successful from the start. Paper was made by hand from rags and it was of excellent quality. In 1697, Rittenhouse acquired the ownership. A flood destroyed the mill in 1701 and a new one was built near the site. Claus Rittenhouse, eldest son of the founder, acquired the ownership of the mill in 1708 on the death of his father. This made him the second paper-mill owner in America. He was born in Holland in 1666 and died in Germantown in 1734, having done much to develop paper making in this country. Father and son established and kept a fine reputation for their paper. It was always equal to the best manufactured in Europe. The mill supplied Bradford's Philadelphia and New York City printing establishments until years after Bradford passed away. As Bradford was the largest and most successful printer and publisher in America and was acquainted with the principal paper manufacturers in Europe, no better testimonial can be required than the simple statement that Bradford's paper was all supplied by the Wissahickon Mill. It showed that the earliest American book and writing paper was of unexcelled quality when such was called for. This supremacy has been continued until today when many of the finest papers manufactured are being made in our mills.

Man Made About 1½ Reams Daily

William Rittenhouse the third, erected a large mill below the Wissahickon mill. This mill was operated successfully until the close of the nineteenth century. The paper in this mill, and several others in the vicinity, was made by hand. It was in sheets 20 x 30 inches. A mill-man made about one and a half reams a day. The price of paper about 1729 varied between 5 and 14 shillings per ream. Writing paper cost 14 shillings, printing paper 7½ shillings and brown wrapping paper 4½ shillings per ream. Rags for paper making cost from 1½ to 2 pennies per pound.

The Rittenhouse family was closely associated with the paper industries for many generations and some of the businesses and mills they established are represented today by corporations engaged in the manufacture of paper on a large scale. We see in the history of the Rittenhouse family the natural aptitude of some members for a chosen industry similar to what has long been observed in the naval, military, diplomatic and medical professions.

Rittenhouse Came to America in 1688

William Rittenhouse arrived in the United States in 1688. He was a pastor of the Mennonite Church. Later in life he became the first Mennonite bishop in America. In addition to his theological work, Rittenhouse studied paper making in mills in Holland. He was astonished to find that no paper was made in the United States and no one knew how to make it. Realizing that there was an opportunity in establishing a plant, he looked around for someone to finance one. He was introduced to the publisher Bradford. This meeting would afford a subject for an historical painter. The paper maker who was intent on found-

ing an industry in America and an active publisher who long sought a paper maker. Fortunately, the two men agreed in their views and determined to build a mill. Articles of agreement were made. Robert Turner, Thomas Tresse and Samuel C. Carpenter, Philadelphia business men found the small amount of capital called for. Early in 1690, two years after Rittenhouse's arrival, the first paper mill was built on Paper Mill Creek, in Roxborough County, Pennsylvania. This was America's pioneer mill. Few who saw it visualized that it was the vanguard of the great mills of today and the first unit in a great and prosperous industry.

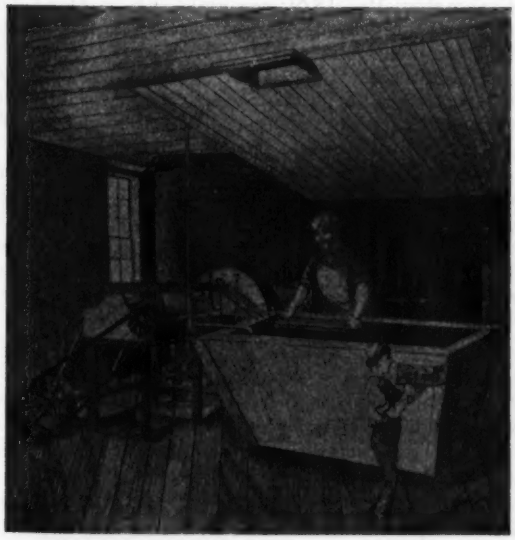
The Paper Creek Mill was worked by hand, employing four men. It made book, writing and news papers. The manufacturer's license gave the owners a ten years' monopoly on paper making. Flood waters destroyed the works in the following year. A new plant was soon built before the end of 1701.

Bradford Bought Whole Output

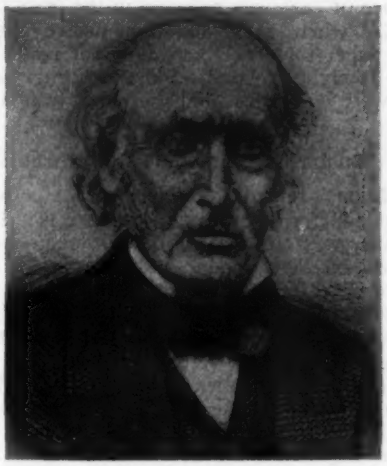
Bradford purchased the whole output of the mill. He was a book, magazine and newspaper publisher in Philadelphia with a large, active business.

The mill was built on a 20 acre land lot. The title was a lease for 99 years. Owing to the owner being absent in Europe, title was not issued until 1706. Rittenhouse was at that time sole owner and Bradford the sole consumer of the mill's output.

When the Rittenhouse monopoly expired at the end of ten years, in 1710, a second papermill was built by another Dutchman, William DeWees. The site was close to the first mill on Wissahickon Creek, Germantown, Pa. Thereafter, mills sprang up in many districts. The foundation of the paper industry having been set, the products being satisfactory to local consumers, progress was rapid. This year, the memory of Rittenhouse was recalled by celebrations and addresses by prominent residents of Philadelphia and Germantown.



Interior View of Early Mill for Hand-made Paper.



David Ames

Great Dearth of Rags

There was a continuous dearth of rags. The colonists were forced to live frugally and they kept their clothes as long as they held together. The result was that the greatest difficulties of paper makers were a chronic scarcity of rags. A New York paper mill published this advertisement: "The printer of this paper, having lately erected a paper mill at Hempstead Harbor, Long Island, N. Y. at a very great expense, the existence of which entirely depends on the supply of rags which at present are very much wanted, he, therefore, most humbly entreats the assistance of the good people of this province (New York) and city (New York) in particular, to assist him in the undertaking, which, if attended with success, will be a saving of some hundreds (of pounds) per annum to the colony, which has been constantly sent out of it for paper of all sorts, the manufacturing of which has but lately originated here; but should the public countenance the same it is more than probable that branch will be brought to considerable perfection in this place. The highest price will therefore be given for all sorts of linen rags by the advertiser." Thirty years later the same manufacturer advertised for rags and indicated that their scarcity was limiting the output of his mill.

About 1776 this advertisement appeared in Boston, Mass.: "The Bell Cart will go through Boston before the end of next month to collect rags for the paper mill at Milton when all people that will encourage the paper manufacture may dispose of them."

The prices paid for rags mounted and indicated the restrictions felt in the manufacture of paper. In 1777 the price paid for rags was three pence per pound; in 1778, eight pence; in 1779, twelve pence; in 1780, three shillings; and in 1781, ten shillings.

The price of rags was reflected in the price of paper. In 1787, when rags sold for twelve shillings a pound, paper sold for six pounds per ream. In 1780 it sold at eighty to one hundred pounds per ream. These were war prices and the pound was a colonial currency.

Business Conditions Unfavorable

Conditions were unfavorable at that period for a healthy industry. The price of paper was high and the quality was not always good although some mills produced excellent paper.

There were 100 paper mills in the country in 1800 and ten years later there were 200. They were located mainly in Pennsylvania, Maine, Massachusetts and Connecticut. They were small mills and all competed for the very limited supplies of rags. For over a century mill advertisements in the newspapers appealed for them.

Linen rags were the first raw materials used in the American paper industry. These became very scarce as the mills grew in number. Cotton rags were used later. Subsequently straw was used after experiments with grasses, cabbage stumps, corn husks and stems, nettles, ferns and a multitude of fiber plants showed they were unsuitable.

The straw pulp industry in America was made possible by a process discovered by Matthias Koops in England in 1800. He operated a mill using straw pulp which produced paper of good quality. William Magaw, of Meadville, Pa., designed a method similar to that of Koops in 1827. Magaw's patents were granted on March 8 and May 22, 1828. He established a mill which produced a strong and durable product which, while slightly tinted yellow, sold up to two dollars per ream, imperial size.

Magaw discussed his method of making pulp from straw with George A. Shryock, a prominent paper maker who operated the Hollywell mill at Chambersburg, Pa. Shryock was interested. He asked Magaw to supply his mill with pulp. He made paper from it and the New Testament and *Philadelphia Bulletin* were printed from it. The results impressed Shryock. He gave up using rags and employed straw pulps in his mill.

Shryock Developes Small Cylinder

Shryock developed a small cylinder machine which he claimed was the first to be used with straw pulp. In experimenting with binderboards and box boards he designed a grooved roll for manufacturing them. He spent $35,000 in enlarging his plant and increasing his output. The prospects of straw pulp seemed so good to Mr. Shryock that he formed a new corporation and built a mill on the Conococheaque Creek, near Chambersburg, Pa. after purchasing the rights to use Magaw's patents in the Eastern States. This mill was 150 feet by 50 feet and five stories in height. It produced 100 lbs. of paper per hour. This was the largest mill in the country until it was destroyed in July 1864 by Confederate troops under General J. A. McCausland.

Mr. Shryock was one of the most enterprising paper makers of his day. He met with many successes as well as losses and, like all in the trade at this period he met with many difficulties. In speaking about his experiences with straw pulp he said: "It is not difficult to tell the history of the origin and progress of the manufacture of straw paper and boards. But who can tell of the toil, anxiety and mental agony endured for the first several years? In my life-long experiments I made paper of every description from straw—wheat, rye, barley, oats and buckwheat—corn-blades, all the grasses, corn-husks, white pine shavings, willow wood, refuse tan and bleached straw. As rags could be bought then for from two and one-half cents to four and one-half cents per pound, it would not pay to bleach straw." In those remarks one of the first references was made to wood pulp.

Magaw's straw pulp process was used for many years. In 1859, Palmer & Howland, of Fort Edward, N. Y., improved Magaw's patents. In the following year, Eben Clemo of Toronto patented means for pulping straw and grasses by treating them with nitric acid and an alkaline solution. Numerous patents were filed at this time for improvements on the Magaw and Clemo processes. The Tail & Holbrooke patent, granted in 1863, was extensively used.

Some paper mills successfully used corn husks, the bark of various trees and palm leaves. It was mainly wrapping paper. The pulps from bark were never colorless.

Early Patents for Pulp

Early patentees for making pulp were: From beach grass, Isaac Sanderson, Milton, Mass., in 1838; corn husks, Burgess Allison and John Hawkins, Burlington, N. J., 1802; leather shavings, Joseph Condit, 1801; John McThorndike, 1814; rags and straw, and corn husks to be mixed with rags, John W. Cooper, Washington, Pa., 1829; sea grass, Elisha H. Collier, Plymouth, Mass., 1828; sea weed, Samuel Green, New London, Conn., 1809; corn husks, Homer Holland, Westfield, Mass., 1838. Patents were granted for the use of sorghum, Spanish grass, reeds, beets, ivory shavings, rope, canvas, corn stalks, corn cobs and cotton stalks.

In Louisiana, in 1800, an exhibition was shown of paper made from bagasse, cotton stalks, wild indigo, banana fibers and several other fiber plants grown near New Orleans. The paper was, in many cases, colored variously. The exhibits showed paper of fine quality running from white writing paper to different classes of wrapping paper.

There was a constant experimenting to find the best materials for paper pulp in the early days of the industry in the United States. The ideal substance was not found. This grouping after a good, cheap easily worked material of the pioneers resembled the search of early man for writing material.

Man, being an extremely social being, at a remote period experimented to find materials for receiving symbols. The bark of trees, soft woods and other

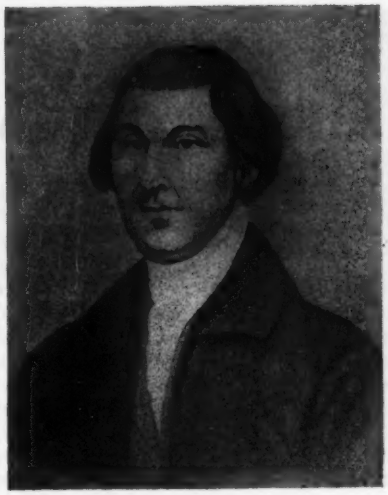
substances were used. Drawings were made on rocks and in caves. Then bricks, tiles and ceramic cylinders were used. Leather, parchment and paper made from papyrus reeds growing in the Nile were used in paper making in Egypt at an early date. Paper was made in China long before the Christian era. The Saracens introduced the Chinese and other Oriental methods of paper manufacture into the Arabian countries and Spain. From Spain it was taken to France, Italy, Austria and Germany. Finally it was carried to England and Holland. These two countries, the last in Europe to establish paper industries, later led the world in its processes. The Moors made paper in Spain in 1150, the French in 1189, the Germans in 1320 and the English in 1400. It was nearly three centuries after England began the manufacture of paper when William Rittenhouse laid the foundation for the industry in the United States. America was a laggard, too, like England and France and like these two countries, America was destined from a small, slow start to develop the greatest industry in the world as well as to lead in processes, machinery and materials.

The rag papers of the early days were made by hand. The process was slow and comparatively costly. The need was felt for speedier means for pulping. The first improvement took the form of a pestle and mortar. This was improved so as to become a battery of stampers or hammers driven by water power. Then three batteries were joined so that a single revolving shaft operated the stampers. The first battery had coarse iron teeth, the next fine teeth and the last strong unshod hardwood. Washing continued through the first two batteries. The sheet was dipped into the mixture of fiber and water in the third battery of beaters and finished by hand. This procedure continued into the eighteenth century.

Dutch Introduce the Hollander

The Dutch have the honor of introducing the next important invention, in 1750 a cylinder beater, called the Hollander. It was an oblong tub with a metal shaft fitted with iron knives acting against an iron bedplate. The knives tore apart the rags which were quickly pulped. The first Hollanders were brought to the United States in 1775 and they were later adopted widely in this country. The principle of this machine, in greatly improved form, is still employed in the industry.

THE ECKSTEIN MILL, MANAYUNK, PHILADELPHIA



DANIEL VOSE

The next revolutionary invention, the principle of which is still dominant in the industry, was the Fourdrinier machine. It was made to relieve papermakers from finishing sheets by hand. The first machine was invented and patented in France in 1779 by M. Robert. The inventor was unsuccessful in securing purchasers in France and he visited London and sold his rights to the prominent firm of stationers, Fourdrinier Brothers. Robert's machine was as simple as it was effective. It matted the fibers by carrying the pulp over an endless traveling wire belt in such a manner that the water drained away through the wire and left the fibers flat and dry. John Gamble patented improvements in Robert's machine in England in 1807. Machines of this type were purchased by Americans in 1827. Our manufacturers were then in a position to abandon hand work and to speed up their paper output while increasing its quality. They were also enabled to remove all restrictions of the sizes of sheets.

American papermakers were now furnished with machinery capable of producing paper in any quantity and quality. They had entered the machine age. Their next move was to introduce a new pulp which rapidly revolutionized the industry, opened up vast fields for distributing paper and by reducing costs, enlarged the scope of paper's usefulness. The passing of thousands of years was required before the machine age was attained. Then the industry made extraordinary strides.

CHAPTER II

Other Paper Mills of Colonial Times

THE early paper mills were established in Pennsylvania. They were engaged in meeting local paper needs. There was a demand for paper in the provinces and gradually mills were erected in other eastern districts. Progress was restricted by difficulties in securing capital, skilled labor and rags. Trouble was experienced in securing tools, presses, vats and moulds. This made production costs high and resulted in dear paper.

The printer Bradford, petitioned the New York general assembly, on July 6, 1724, to allow him to have introduced into the council a bill to secure to him a monopoly of paper making for a period of fifteen years in the province of New York. This bill was rejected. Bradford moved his plant to Elizabeth, N. J., where, in 1728, he purchased a mill which he and his son Andrew Bradford operated successfully until about 1740.

The New England colonies having ample water power were ideal for the paper industry. Bostonians realized this and led by Daniel Henchman a syndicate was formed in 1728. Permission to engage in industrial work at that time had to be secured from the government. A new industry was looked upon as a public utility and had to be passed upon by a board corresponding to the public service commission of today. The granting of authority was given in a majestic legal document like a railroad charter.

Encourage Paper Manufacture

The Massachusetts charter granted to Henchman and his associates was worded as follows:

An Act for the Encouragement of Making Paper.

"Whereas the Making Paper within this Province will be of Public Benefit and Service; But inasmuch as the Erecting Mills for that purpose and providing Workmen and Materials for the Effecting that Undertaking will necessarily demand a considerable Disburse of Money for some time before any profit, or gain can arise there-from; And whereas Daniel Henchman, Gillam Phillips, Benjamin Faneuil and Thomas Hancock, together with Henry Dering, are willing & desirous to Undertake the Manufacturing Paper; Wherefore, for the Promoting so beneficial a Design;

"Be it Enacted by His Excellency the Governour, Council and Representatives in General Court Assembled, and by the Authority of the same, That the sole Privilege and Benefit of making Paper within this Province shall be to the said Daniel Henchman, Gillam Phillips, Benjamin Faneuil, Thomas Hancock and Henry Dering, and to their Associates, for and during the Term of Ten Years from and after the Tenth Day of December next ensuing: provided the aforesaid Daniel Henchman, Gillam Phillips, Benjamin Faneuil, Thomas Hancock and Henry Dering, shall make or cause to be made within this Province, in the space of Twelve Months next after the Tenth Day of December, next, Two hundred Rheam of good Merchantable Brown Paper, and Printing Paper, Sixty Rheams thereof at least to be Printing Paper, and within the space of Twelve Months then next coming, shall cause to be made within this Province Fifty Rheam of good Merchantable Writing Paper, of equal goodness with the Paper commonly stampt with the London arms, over and above the aforesaid Two Hundred Rheam of Brown Paper, and Printing Paper.

"AND further, That the aforesaid Daniel Henchman, Gillam Phillips, Benjamin Faneuil, and Thomas Hancock, together with Henry Dering, proceed and make Twenty-five Rheam of finer & better Writing Paper in this Province, as aforesaid, at or before the Tenth Day of December, which will be in the Year of Our Lord One thousand seven hundred & thirty-one and continue to make the Quantities and Species of paper before Enumerated in the aforesaid Two Years, and that they make or cause to be made within the space of Twelve Months, from and after the said Tenth of December 1731. Five hundred Rheam of good Merchantable Writing and Printing Paper, One hundred and fifty Rheam thereof at least to be Writing Paper, and continue to make the like Quantity of Five hundred Rheam, as aforesaid, every Year, for and during the remaining part of the said Ten Years; and if any person or persons shall make any Paper within this Province, without leave first had and obtained from the said Daniel Henchman, Gillam Phillips, Benjamin Faneuil, Thomas Hancock and Henry Dering, he or they so making the same shall pay Twenty Shillings for every Rheam of Paper Manufactured in this Province, as aforesaid; One half of the said Twenty Shillings to be to and for the Undertakers Daniel Henchman, Gillam Phillips, Benjamin Faneuil, Thomas Hamilton and Henry Dering, and their Associates; the other half to the use of the Poor of the Town where the Paper shall be exposed to sale, or brought and found, to be recovered by the said Undertakers, by Bill, Plaint or Information in any of His Majesties Courts of Record within the County, where the offence shall be committed, or before any Justice of the Peace in the same County where the forfeiture shall not exceed Forty Shillings."

Became Celebrated Men

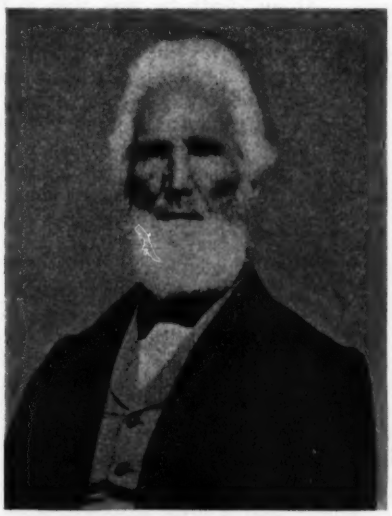
The incorporators of the Milton Mill, on the Neponset River, became celebrated men. Hancock became one of Boston's wealthiest men. He was un-

cle of John Hancock of the revolutionary period. Faneuil, Phillips and Dering, established families that are represented in New England today. This firm had a monopoly of the paper trade in Massachusetts until 1738. Thereafter numerous small mills were built in several parts of the province.

The Civil War caused a shortage of paper and prices advanced so high as to offer a premium on paper manufacturing. Numerous mills were built and were prosperous between 1860 and 1865. Then a reaction was experienced and prices slumped so badly that most of the mills were forced to close. In 1860, there were in operation along the Charles River, the Foster, Wales & Mills, Rice & Garfield, the Crehore and Curtis paper mills.

A mill was operated at Newton Lower Falls, on the Charles River, in 1790, by John Ware, an officer in the Revolutionary war. Walter Ware, his son, went to Canada and built the first paper mill there in 1804. It was erected at St. Andrews in Quebec.

The Ware Mill was sold on October 7, 1815, to a group of men who became famous in New England paper manufacturing history. It included William Hurd, John Marston, Charles Jackson and Charles Bemis. The Ware Mill was carried on through many difficulties occasioned by political and business conditions of the time and in October, 1823, William Hurd became sole owner who carried it on until 1825 when he admitted to partnership Lemuel Crehore, a man who became a famous industrialist in New England. The mill was enlarged and furnished with improved machinery. On October 15, 1834, Hurd sold his interest to Crehore. On July 26, 1836, Crehore engaged in partnership Benjamin Neal and the firm became known as Crehore & Neal. It built up a large business. In 1845, the firm was dissolved. At this time the mill operated four 32 inch beaters, a 62 inch Fourdrinier machine and a 36 inch Cylinder machine on book paper. The



George W. Knowlton

Sunnydale Paper Mill

products of the mill were newsprint, writing and book papers, wrapping paper and cardboard. In later years the mill was operated by Lemuel's son, George Crehore under the firm name of L. Crehore and Son. In 1867, Dr. Charles Frederick Crehore, a distinguished surgeon in the Civil War, in which he was Surgeon-in-Chief of the Army, became a partner and assumed the management of the mill until 1919 when he died. The mill was then sold after being operated for nearly a century by one family. Many other mills were carried on by the descendents of pioneer paper-making families.

The Curtis family was as well-known as the Crehore. Solomon Curtis, its founder, built a mill on the Charles River in 1790. In 1792 he purchased an interest in the Ephrain Jackson Mill. In 1799, after several changes had been made in the partnership, Curtis and Simon Elliott acquired the property. Curtis bought out Elliott on April 3, 1804 and the name of the plant was changed to the Curtis Mill.

Allen and William Curtis, sons of Solomon Curtis, purchased the mill in 1831. They equipped it with new machinery and, in 1834, built a new stone factory, which is still standing. Curtis Brothers made news, writing and book papers. They made, for a local bank in 1820, bank note paper permeated by matted mohair threads. This was probably the first paper of its kind made in the United States. This business was carried on successfully until the Civil War when the general business depression caused the mill to be closed down. After the war it was sold to the Cordingly Company and used as a wool-extract plant.

Famous Families Operate Mills

Wales & Mills were important paper manufacturers on the Charles River between 1843 and 1873. This plant was at different times later operated by the Curtis, Jackson, Rice, Garfield, Bigelow, Parker, Hurd, Stevens, Hooker, Nichols and other famous families. It was burnt down half a dozen times, on each occasion the plant was rebuilt in larger and better-equipped forms. The last fire was in 1894. The associations of the leading paper-makers of the district with this mill serves as another illustration of the fact, often observed, that once in paper, men are prone to continue in it generation after generation. Many present day descendents of

the above and other New England families are engaged as paper brokers, distributers and factors in many cities.

Samuel Babcock built and operated a paper mill in Springfield, Mass. This was the first mill to operate in the district. Eleazer Wright was the next to build a mill in Springfield. This mill, built in 1788, subsequently became famous as one of the early properties of the Ames family of manufacturers.

David Ames, an officer of the revolutionary army, in Washington's second term, was sent to Springfield to build a national armory. Colonel Ames arrived there in 1794 and built the armory. He was its superintendent during the next eight years. In 1802, he acquired the Babcock mill which he improved. His sons, David, Jr. and John, became partners in 1820 and their enthusiasm for the business caused it to forge ahead. John Ames was mechanically inclined. He invented improved machinery and continually made improvements which benefitted the whole industry. The firm became known as D. & J. Ames after the retirement of Colonel David Ames. In 1815, the Ames's purchased the Bowman & Cox Mill, established in Chicopee, Springfield, in 1806. They enlarged the mill and equipped it with new machinery. This mill was in continuous operation for nearly half a century. Its last proprietor was John Valentine.

Ames Brothers Introduce Loading

When the Ames brothers took over their father's mills, there were at one time five of them, a method of loading or weighting paper with lime sulphate had been discovered by some English manufacturers. The Ames's introduced the practice into their mills. One of their foremen gave this interesting account of their method. "There was an old gypsum mine near their Water Shops mill in Springfield. This they mined and crushed with a crude grinder and, after screening a little, wheeled it to the side of the beaters and shovelled in all they thought the stuff would carry. One of the effects of this kind of pulp was to make the paper quite gritty, almost like very fine sand paper. The old cylinder machine with one large fire drier was run about twelve hours per day and during this time the gypsum would accumulate on the drier so thick that very little heat could get through it. A good strong scraper was then employed to clean it and the machine was ready to go ahead again."

The above description shows a sidelight on the crudeness of some of the operations in paper mills of the period. There was no intense competition in distribution at the time and most mills had regular customers for their products. Not only was paper of poor quality produced some times, but other censurable practices were indulged in. Various grades of paper were made from the same stock by the same processes. When book or newspaper was selling around nine and ten cents per pound, it was not uncommon for some mills to cut it up and sell the same paper as writing paper at eighteen to twenty cents a pound.

The panic of 1837 caused many mills to fail. The Ames's failed and they never secured another mill. David Ames died on August 6, 1847, aged eighty-seven years. David Ames, Jr., died on March 12, 1883, aged ninety-two and his brother John Ames died on January 25, 1890, at the age of ninety.

In 1779, the residents of Pittsfield, Mass., seeing how small paper mills operating in many localities in Massachusetts, gave employment to many people, wanted a mill established in their village. They petitioned the General Court in Boston to use their "best endeavors, that any petition which may be preferred from Pittsfield, or from any individual of it, respecting the erecting of a paper mill in the town, be attended to by you in the General Court." Some years passed before this petition resulted in action.

Crane Family Comes on Scene

The Crane family now came on the scene. Zenas Crane, of Canton, Mass., a village near the Milton paper mills, where he learned the trade, was attracted to the Berkshires on account of its excellent water power, and other advantages. In partnership with John Willard, he started a mill in Dalton, in 1801. At the end of the year Daniel Gilbert purchased Willard's interest and the firm became known as Crane & Gilbert. They made book, news and writing paper. The mill products were marketed in Albany, N. Y. Crane left the firm in 1807, and in 1809, he returned to papermaking and acquired the mill which later became famous under the name of Crane's Old Red Mill. Mr. Crane operated this mill until 1842. He died in 1845.

Zenas M. Crane succeeded to the mill on the death of his father. Under him it became very prosperous. At his death he was able to bequeath a large fortune to his youngest son, Winthrop Murray Crane who took over the ownership and management of the mill. Success attended his efforts and Crane papers became the best sellers on the market. Winthrop Crane was born in Dalton, Mass., on April 23, 1853, and died there on October 2, 1920. He was a politician as well as industrialist and became the most widely known member of his family. He spent forty years in politics and among many public offices he was Lieutenant-Governor and Governor of Massachusetts and Senator from his native state. He was a popular man and a hard worker. Calvin Coolidge held the opinion that Winthrop M. Crane: "Inspired love in all who knew him. In the affection of his fellow men, he stood first in Massachusetts. It is no doubt a commonplace to say our Commonwealth will never be the same without him, but his loss will be felt in a way that will not be commonplace."

The paper trade knew him as a worthy rival, a vigorous worker and a loyal associate who was respected alike by labor in his mills and the officials in

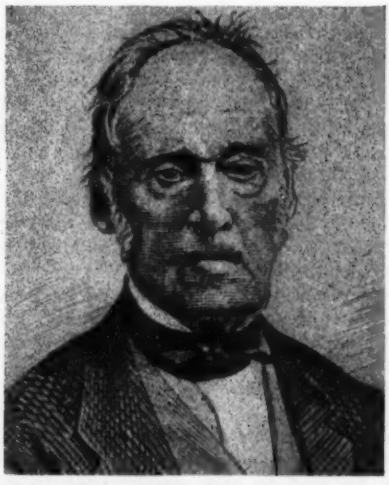
his offices. He was a master of the paper business, having in his youth served a working apprenticeship in every part of it. At his death it was said of him that: "His farsightedness and industry built up a perfect business structure which will prove a fitting monument to him for many years to come."

The Nehoiden Mill was established on January 13, 1794, by Stephen Crane, the elder brother of Zenas Crane, and Edward Jackson, Joseph Greene and William Hoogs. This famous mill changed ownership many times in its long career. In 1866 it was operated by Joseph G. Loring & Co. who made paper from esparto grass. In 1867, B. S. Binney & Co. made paper bags. In 1868 it was destroyed by fire. Binney & Co. rebuilt the mill and operated it until 1870 when Charles Francis and later R. T. Sullivan converted it into a woolen mill. It has continued in the wool business since. Many of the pioneer paper factories found in their old age service in some branch of woolen manufacture.

In 1825 there were about twenty-five small paper mills in Massachusetts and several in Connecticut in operation. Starting in Pennsylvania, mills were built wherever newspapers of large circulation were established. The building of mills followed the local demands for paper for two reasons. The first was cheapness of distribution. No high transportation charges had to be met. The other reason was equally practical. Local mills were able to supply paper continuously. There were no publication delays through newspapers running out of paper stocks. Paper mills and newspapers have always been closely associated.

There were about 100 paper mills in the United States at the beginning of the nineteenth century. From 1800 on, they increased rapidly. It was estimated that in 1830 there were over 150 mills, but statistics were not then on a scientific basis. The House of Representatives in Washington on June 7, 1809, called upon the Secretary of the Treasury, Albert Gallatin, to report on the manufacturing industries of the country. He discovered endless difficulties in securing information. His report, filed a year later was most incomplete. He could do little with the paper makers. He reported that: "Some foreign paper is imported still, but the greater part of the consumption is of American manufacture; and it is believed that if sufficient attention were everywhere paid to the preservation of rags, a quantity equal to the demand would be made in the United States. Paper mills are erected in every part of the Union. There are twenty-one in the states of New Hampshire, Vermont, Rhode Island and Delaware alone and ten in only five counties of the states of New York and Maryland. Eleven of the mills employ a capital of two hundred thousand dollars and one hundred and eighty workmen. They make annually one hundred and fifty thousand dollars worth of paper. Statistics are difficult to gather. The manufactures of hanging (wall) paper and playing cards are also extensive."

ZENAS CRANE



JOHN AMES

The First Census of Manufactures

Gallatin's report showed the need of a census of manufactures and in the same year, 1810, a census was begun. The first census was no improvement on Gallatin's Report. The returns, through the lack of skill of the marshals collecting data and the reluctance of manufacturers to give facts about their operations, made the first census irregular, deficient, erroneous and unreliable.

J. L. Bishop in his History of American Manufacturers, published in 1868, gave this picture of the deficiencies of the first census: "The number of printing offices—given by Isaiah Thomas, a competent statistician, at more than 400 in 1810—were returned by the marshals as 110. Bookbinders, calico printers and dyeing establishments were returned for one state only. No glass works were returned for Massachusetts, which had long made and exported glass of a superior quality to other states. Bark mills were given for only one state; carriage makers for three; blacksmith's shops for five; hatters for

four; tin and copperware shops for two—and these the least considerable."

A census of that character was better than none. Congress retained Tench Coxe of Philadelphia, economist and statistician, to analyze the census returns and to place them in order. He reported to Congress in June, 1813. His report is the first understandable account of American manufactures made up to that date. It became the style-sheet for several subsequent census reports.

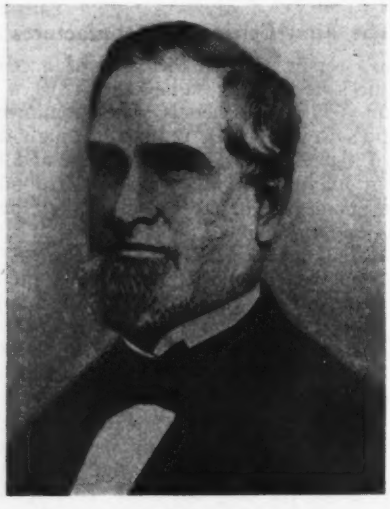
Paper Products Estimated at $1,939,285

The first census showed that the value of all manufactures in the United States was $127,694,602 in 1810. Paper, pasteboard, cards and other paper products were estimated to be worth $1,939,285 annually. Mr. Coxe, as a result of his own investigations, increased the census returns by a little over 35 per cent. This gave the paper industries an annual value of $2,600,000. This amounted to a little more than two and one-half per cent of the total value of manufactures.

The following interesting figures for paper were given in the Coxe report:

States, Territories and Districts	Mills	Reams	Value of Product
Maine	2	4,500	$16,000
Massachusetts	23	95,129	290,951
New Hampshire	6	.....	42,450
Vermont	11	23,350	70,050
Rhode Island	3	14,625	53,297
Connecticut	19	.....	82,188
New York	28	77,756	232,268
New Jersey	14	10,380	49,750
Pennsylvania	64	165,981	626,749
Delaware	4	.....	75,000
Maryland	9	22,200	77,515
Virginia	4	3,000	22,400
Ohio	2	.....	10,000
Kentucky	6	6,200	18,600
North Carolina	3	2,400	6,000
East Tennessee	2	.....	15,500
South Carolina	1	.....	.....
District of Columbia	1	.....	.....
	202	425,521	1,689,718

More than half the mills are seen to be situated in Pennsylvania, the pioneer and still the most important state, in Connecticut, New York and New Jersey.



C. H. Dexter

A More Complete and Accurate Report

In the same year Isaiah Thomas made an independent study of the paper industry and made a more complete, more accurate and valuable report. He wrote:

"My endeavors to obtain an accurate account of the paper mills in the United States have not succeeded agreeably to my wishes, as I am not enabled to procure a complete list of the mills, and the quantity of paper manufactured in all the states. I have not received any particulars that can be relied on from some of the states; but I believe the following statement will come near the truth. From the information I have collected it appears that the mills for manufacturing paper are in number about one hundred and eighty-five (sic), viz.: in New Hampshire, 7; Massachusetts, 40; Rhode Island, 4; Connecticut, 17; Vermont, 9; New York, 12; Delaware, 10; Maryland, 3; Virginia, 4; South Carolina, 1; Kentucky, 6; Tennessee, 4; Pennsylvania, about sixty; in all other states and territories, say 18. Total 195, in the year 1810.

"At these mills it may be estimated that there are manufactured annually 50,000 reams of paper, which is consumed in the publication of 22,500,000 newspapers. This kind of paper is at various prices according to the quality and size, and will average three dollars per ream; at which this quantity will amount to 150,000 dollars. The weight of the paper will be about 500 tons.

"The paper manufactured and used for book printing may be calculated at about 70,000 reams per annum, a considerable part of which is used for spelling and other small school books. This paper is also of various qualities and prices, of which the average may be three dollars and a half per ream, and at that price it will amount to 245,000 dollars and may weigh about 630 tons.

"Of writing paper, supposing each mill should make 600 reams per annum, it will amount to 110,000 reams, which at the average price of three dollars per ream will be equal in value to 333,000 dollars, and the weight of it will be about 650 tons.

"Of wrapping paper the quantity made may be computed at least at 100,000 reams, which will amount to about 83,000 dollars.

"Beside the preceding articles, of paper for hangings, for clothiers, for cards, bonnets, cartridge paper, pasteboards, etc., a sufficient quantity is made for home consumption.

"Most of the mills in New England have two vats each. Some in New York, Pennsylvania, Delaware and Maryland have three or more. Those with two vats can make, of various descriptions of paper, from 2,000 to 3,000 reams per annum. A mill with two vats requires a capital of about 10,000 dollars, and employs twelve or more persons, consisting of men, boys and girls, collecting rags, making paper, etc., may be said to give employment to not less than 2,500 persons in the United States.

"Some of the mills are known to make upwards of 3,000 reams of writing paper per annum; a few do not make any; but there are not many that make less than 500 reams. The quantity of rags, old sails, ropes, junk, and other substances of which various kinds of paper and pasteboards are made, may be computed to amount to not less than three thousand five hundred tons yearly."

Industry Shows Primitive Condition

This report shows the primitive conditions of the industry in the early part of the nineteenth century. America was at war with Great Britain and, while the demand for paper was good, the raw materials were scarce. Newspapers of the period carried advertisements for rags, rope and other materials. In the light of our present knowledge, it appears ironical that there was a material shortage in a land of abundant forests. It is an indication of how, when knowledge lingers, industry may languish. The paper industry has experienced similar difficulties at various times.

Though business conditions were hard during the war, some Americans were of good heart as the following views of a New Haven newspaper editor testified. He had purchased in New York a supply of newsprint which was shipped by the packet "Susan." The packet was captured by a British naval boat and the paper had to be ransomed by a fee which almost amounted to its cost. The editor wrote as follows:

"Our Patrons must pardon us for giving them a very inferior quality of paper this week. Fortune has frowned upon the printer, and placed in the hands of the enemy, by the capture of the "Susan," our stock of paper for several months, worth between 200 and 300 dollars. It will be obtained, however, by paying nearly its value over again. Our friends who are in arrears at this office, it is hoped, will remember not to forget the publisher at this time."

American Wood Paper Co., Royer's Ford

This heart to heart talk appears naïve today. It reflects a different ethical and business age when men placed trust in each other. The amount of paper consumed by the New Haven Columbia Register in 1814 serves as a measure of business activities in Connecticut at that time.

Rag Scarcity a Continuous Handicap

Fears inspired by the war, the disruptions it caused in business, the lack of confidence in the future, transportation and financing difficulties, dejected business men. Some of them attributed their troubles to imports. Their complaints led to demands of Congress from all parts of the country for the prohibition, or heavy taxation, of all foreign goods imported. In 1816 and 1818 tariff acts were applied, but failed to give relief. There was a business panic in 1819 followed by a severe depression. The Society of Paper-Makers in 1820 memorialized Congress for a higher duty on imported paper. They asked for a tax of twenty-five cents per pound on all imported writing, book, news and copper-plate papers and fifteen cents per pound on all others. They succeeded in getting higher duties, but the scarcity of rags plagued them until nearly the end of the century.

CHAPTER III

The Use of Papermaking Machinery

AFTER the foundation of the paper industry in Pennsylvania and the New England states, New York developed numerous small mills. Later, mills were established in Northern, Southern and Western districts. In Mr. Coxe's census of manufactures published in 1813, there were 200 paper mills in operation. Of 64 were in Pennsylvania, 28 in New York, 19 in Connecticut, 11 in Vermont, 23 in Massachusetts and smaller numbers in Delaware, Maryland, Virginia, Kentucky, North and South Carolina, Tennessee and Ohio. Paper was made wherever there were important newspapers.

Nathaniel Rochester was the pioneer in paper making in New York. He erected a mill in Dansville. Rochester was a native of North Carolina and a friend of President Washington. He was in the national army during the Revolutionary War. In 1810, he retired from the army, went north to New York and embarked in paper manufacturing. The mill was small, business conditions were difficult and Colonel Rochester had other interests. He sold the mill to local men in 1814. This mill attracted attention and in a few years numerous other mills were built in Dansville.

A Famous Mill Described

The Eagle Mill, built in Dansville in 1824 by Andrew Porter, became famous and continued in

operation for nearly a century. A reporter visiting it in its ninetieth year gave this description of the old plant:

"The machine on which the paper is made is said to have been built by a local wheelwright, a slender wooden affair of barely twenty feet in length and thirty-six inches in width. The entire plant is operated by water-power, its huge, old wooden waterwheel creaking noisily under its ceaseless burden. The dam, from which the water is drawn, is one of those old-fashioned affairs which, owing to the scarcity of the supply, exposes shamelessly its structural features to the public gaze. A wooden flume, perched above the ground upon scantling supports, carries the water to the mill, a hundred yards distant, leaking copiously all the way. There are two beaters, each of a capacity of about two hundred and fifty pounds, located in the loft, and the pulp runs into a vat below, from which it is pumped up to the machine.

"The machine is in every way singularly deficient in labor-saving devices. The pulp is carried on a blanket instead of a Fourdrinier wire, which permits the water to percolate through. There are but four small heated cylinders, instead of the huge batteries of driers seen on even the smallest of modern machines. There are neither suction boxes, calendering rolls nor cutting disks, and the water, as it is pressed from the pulp, is permitted to drip about the machine with heedless prodigality.

"The reel on which the paper is taken off is a rough, wooden spindle affair, regulated in its action by iron weights on the end of a rope. A stop-gauge guillotine cutter takes it from the roll, and the operator, at his leisure, cuts it to size, sheet by sheet. If it is required to cut the paper to a smaller size, it is folded and torn apart over a scythe blade attached to the wall. The mill is said to have a maximum capacity of two thousand pounds for twenty-four hours, but, as it is operated throughout by one man, the output is probably considerably less than half a ton a day."

Fire destroyed this mill on January 8, 1914, just before the World War and it has not been rebuilt. The machinery in this mill was similar to that in use in a majority of the country's small plants. It was astonishing that, with so much inventive talent in America, the paper industry delayed long in modernizing its plants. Finally, when modernizing began, the machinery had to be imported mostly from Europe.

The first workable Fourdrinier machine, however, was invented and patented in France by M. Robert in 1799. Henry and Sealey Fourdrinier, wholesale stationers in London, purchased the British patent rights. They employed a well-known consulting engineer, Bryan Donkin, to improve it. The improved machine was patented in England by the Fourdriniers in 1807. This improved machine revolutionized paper manufacture and was the first great invention to the paper industry. Another notable invention was made by John Dickinson of London, who in 1809, patented a cylinder covered with a wire screen which revolved in a pulp vat. Suction forced the pulp fibers to settle on the screen and become a sheet of paper. This wet paper was drawn on to another cylinder covered with felt and then put in a drying room.

Tennessee Encourages Paper Making

Tennessee, before the Civil War, was a paper-making state. In 1809, the General Assembly enacted two statutes to encourage the industry. The first which was approved on November 13, 1809, determined that: "Whereas, it is considered by the present legislature that an increase in the home manufacture will promote the independence of our rising state: Therefore, be it enacted by the General Assembly of the State of Tennessee that, from and after the passage of this Act, all persons immediately in the employment of the manufacture of paper in any of the paper mills erected in this State, or that may be hereafter erected, that they be and are hereby exempt from working on roads or highways or from attending musters in the companies, regiments or battalions to which they belong, provided that in all calls for militia they shall be subject in the same manner as they would have been had this Act never been passed."

This concession granted labor in the paper mills freedom from military drills and parades so that paper production could be maintained. The men were not exempt from service in the field. The concession was made because of the shortage and high prices asked for the various grades of paper.

The other Statute was dated November 23, 1811. It remitted a business tax on rags so that: "To encourage the manufacture of paper: Be it enacted, That all persons who are owners of paper, or shall hereafter be, shall be allowed to employ some person to peddle and merchandise rags without paying tax, provided nothing herein contained shall authorize those persons to take or receive any money or articles for said goods but rags."

Similar laws appear to have been passed in other states. All were interested in promoting new industries and paper manufacture promised to develop to large dimensions. There was everywhere a keen demand for paper and a scarcity of rags. All the newspapers of the period carried advertising, often quite amusing, seeking rags and stressing the importance of collecting them. It was at this time that the domestic institution of the old rag bag, for the collection of rags, came into prominence.

A Conspicuous Tennessee Paper Man

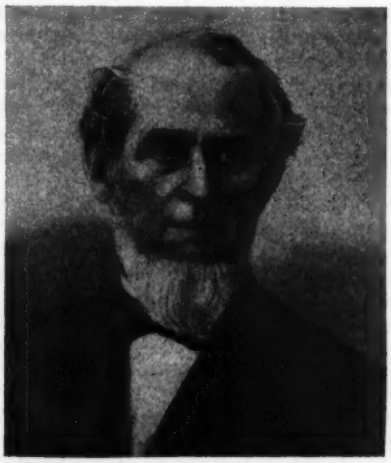
W. S. Whiteman, of Knoxville, was one of the most conspicuous of Tennessee's paper men. He learned the trade in Pennsylvania mills, worked in Tennessee mills and built his own mill on Middle Brook Creek, near Knoxville in 1835. It was a primitive mill, like the others at that date, furnished with machinery acquired in Philadelphia. Mr. Whiteman died in 1840 and his sons took over the business and built it up into an industry of importance.

W. S. Whiteman, Jr., learned the trade in his father's mill. In 1840, he formed a corporation with John M. Hill, John McEwen and O. B. Hayes. A mill was built on Cumberland Creek and it was operated successfully by the company until 1848 when it was purchased by W. S. Whiteman, Jr. The Whiteman Brothers with W. O. Harris, publisher of the *Nashville Banner*, erected a mill on White's Creek. They also established a pulp mill for rags on Paradise Ridge. The Whiteman Brothers operated several other mills at this time, the chief of which was the Cumberland River. There were, in 1840, six other mills near Knoxville. They were operated by Messrs. Davidson, Sumner, Sullivan, McMinn, Knox and Granger. The combined capital of the Tennessee mills in that year hardly exceeded $150,000, but their operations proved to be valuable to the state.

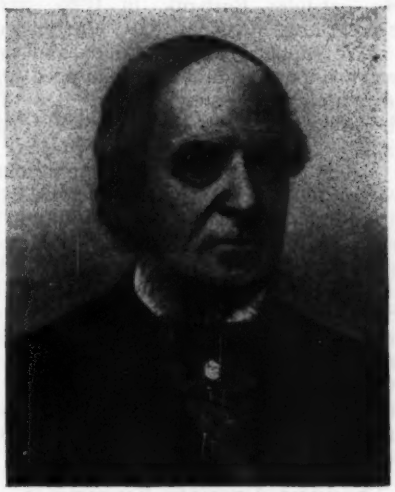
The pioneer paper mill in Louisville, Ky., was built by Jacob & Hicks in 1814, to supply paper to a local newspaper. There were nearly a dozen mills operating in Kentucky in 1815—two of which employed steam power.

The people of the town of the Forks of Elkhorn, Ky., tell an illuminating story of the founding of a paper mill on the river a mile and a half below the town. Amos Kendall, a political supporter of President Andrew Jackson, hearing that the government intended building an armory on the site, bought the land and constructed the mill in 1820. He was wrong in his speculation. The armory was built elsewhere. When Kendall heard of this he sold the mill to E. H. Steadman. This property was purchased by DuPont & Co. in 1875.

Kendall went to Andrew Jackson for solace and was rewarded by a cabinet position. He became Postmaster General of the United States. This was one of the early encounters between the paper making industry and politics and showed the crude condition of political morality prevailing at that period.



J. C. Parsons



Wells Southworth

American paper makers had received accounts of Robert's, Fourdrinier Brothers' and Dickinson's inventions when the patents were issued. Many built experimental machines. It was twenty years after Robert's and seven years after Dickinson's patents were granted before the first cylinder machine was commercially used in the United States.

Joshua Gilpin, who had built and patented one in 1816, placed it in operation in his mill a year later. This was so successful that the business grew rapidly. Papermakers from all the states visited the Gilpin factory. Earlier in 1807 Charles Kinsey, Essex, N. J., patented a cylinder machine and John Ames of Massachusetts secured a patent also. These patents led to litigation extending over many years.

The First Efficient Mechanical Paper Mill

The Gilpin Mill was the home of the first efficient mechanical paper plant operated in America. Its machines showed speed, economy in manufacturing and production while yielding papers of higher qualities.

The Gilpins tried to keep the details of construction of their cylinder secret. News travels fast and visitors to the mill and to exhibitions of its products told stories of their excellence that attracted the attention of the trade. It was the first extensive publicity given to any American paper mill machinery. The more publicity the mill acquired, the more jealously the Gilpins tried to keep the details of their machine secret. It was in vain. Competitors strove to improve the quality of their paper and found a machine like Gilpin's was essential. More experiments were conducted and many new machines were built. Between 1818 and 1830 numerous mills were equipped with cylinder machines. The result was a loss in the Gilpins' business, their prestige declined and, eventually, they failed.

Among other successful cylinder machine makers were John Ames, Isaac Burbank, Worcester, Mass.,

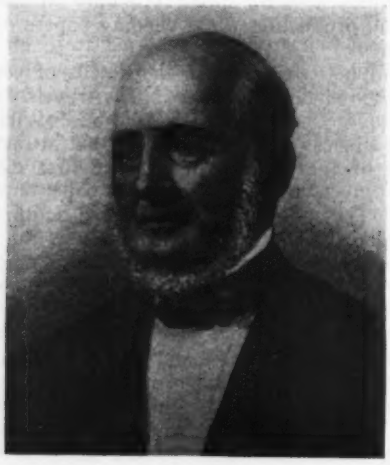
in 1824; Garinder Burbank, in 1826; and Isaac Sanderson, Milton, Mass., in 1829. Machines of these makers were supplied to many mills and in a few years every important mill was equipped with one or more cylinder machines.

Bryan Donkin, between 1807 and 1830, made 200 Fourdrinier machines in England. In 1827 Henry Barclay, fourteen years after the Fourdrinier Brothers secured Robert's patent, imported the first Fourdrinier into America. It was sold to Beach, Hommerken & Kearney and erected in their mill in Saugerties, N. Y. It was a Donkin machine 60 inches wide. This machine was in constant use until 1872 when it was destroyed in the mill fire. The second Fourdrinier machine built in England by Joseph Newbold, of Bury, was erected in the same mill in 1829. These pioneer machines attracted wide attention and, in a few years, all the larger mills in the United States were fitted with Fourdriniers.

The First American Fourdrinier

The Smith & Winchester Manufacturing Company, South Windham, Conn., built the first American Fourdrinier in 1829. It was purchased by the Hubbard Mill, Norwich, Conn. It gave good service and was followed by the building of many similar machines.

James M. Wilcox, of the Ivy Mills, in Pennsylvania, described the machinery in use in American paper mills in 1850. He said all the early improved machines were imported from England. The English Fourdriniers were not always suited to American conditions and were too expensive. The Fourdriniers made locally, in his opinion, were better, especially those made by Phelps & Spafford, of Windham, Conn., and by Howe & Goddard, of Worcester, Mass., the principal manufacturers. His opinion of cylinder machines was that: "The cylinder machines, more simple and less costly than the Fourdrinier, are in more general use; but the paper made on them is not equal in quality. They do very well for news and the various purposes for which a coarse article will serve."



ALVAH CROCKER

Felts were imported from England up to 1864. In that year Johnson, Fuller & Co., Camden, Me., undertook their manufacture. This firm was purchased in 1872 by the Knox Woolen Company and the felts are now made by one of its successors.

Fourdrinier wire was imported from England in the early days. In 1847, William Staniar of Manchester, England, an expert wire drawer, came to America to establish a works to manufacture Fourdrinier wire. He became associated as a partner with Stephens & Thomas of Belleville, N. J. Cornelius Van Houten made the first American loom for Stephens & Thomas and Staniar turned out wire. Difficulties from many causes were met with in distributing the wire. They were overcome. Later Robert Buchanan and John McMurray came from Glasgow, Scotland, and established wire works in Jersey City, N. J. By 1897, there were twenty factories in the United States running over 200 looms on Fourdrinier wires, cylinder covers, dandy covers and washer wires.

The First American Dandy Roll

Staniar and Van Houten, of the Stephens & Thomas works, made the first American dandy roll in Belleville in 1847. According to William Staniar, "Four impressions of a sheet 22 by 24 inches were taken off and 42 impressions were put in the same place, there being 1,092 letters, some of the Romans were not more than one-eighth of an inch in size."

Many patents were taken out between 1800 and 1830 for paper mill machinery. They ranged over a narrow field owing to the difficulties experienced by inventors in securing the adoption of their machines or in getting adequate capital. They were concentrated on improvements in cylinder machines; methods for pulping vegetable fibers; sizing, weighting and cutting paper sheets; drying and pressing appliances and cutting rags or making molds. The general use of rags had a marked restrictive effect on plant development also.

The subsequent replacement of water power in mills for steam and electricity proved beneficial to inventors and in a still later period, the introduction of chemical processes led to the greatest revolution the industry had experienced.

In all ages the practice of an art lags behind scientific and theoretical knowledge of the art. This is because man is a creature of habits. It requires long practice to acquire a habit and when one is attained, it is difficult to modify, or abandon it. Business men study habits for acquiring wealth and have little time for scientific and theoretical speculations regarding their business. They are consequently nearly always conservative. Many demonstrations of improved machinery and processes must be made to convince them. In the pioneer days of the industry empirical rules dominated the mills, and the pleadings of inventors were unheard.

CHAPTER IV

Paper Mills Spread To Various Sections

THE first paper mill in western Pennsylvania was built in Brownsville, on the Monomgahela River. It was called the Old Redstone Mill by its owners, Samuel Jackson and Jonathan Sharpless. The mill was opened in 1796 and supplied the newsprint for the *Pittsburgh Gazette* and other newspapers. The mill also made book and writing papers.

The pioneer mill in Wisconsin was built in 1846 at the junction of the Milwaukee and Menomonee rivers, where Milwaukee is now situated. It was operated by its founders, Livingston & Garland until 1851 when the Milwaukee and St. Paul Railroad Company purchased the site for a warehouse. The machinery was taken to Humboldt, three miles north of Milwaukee, and used in a new mill owned by Noonan & McNab. This mill operated until 1867 when it was destroyed by a flood. The owners then purchased the Prieger Mill on the Menomonee which they operated until 1874 when it was destroyed by fire.

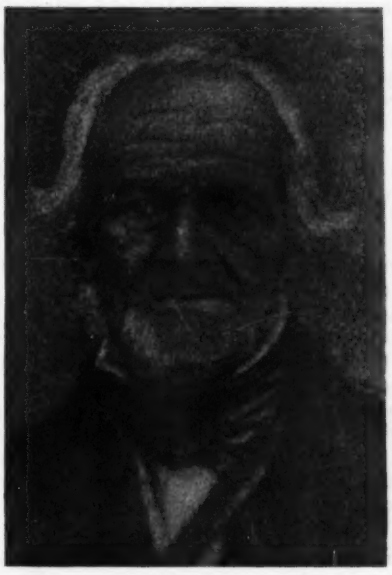
Other Mills Around Milwaukee

Other mills around Milwaukee were built between 1860 and 1870 by Alexander Mills, G. N. Richmond, Butler & Hunt, Bradner Smith & Co., The Ames Wood Pulp Company, F. N. Davis & Company, Wright, Merrill & Newcombe, L. J. Mathers and Nightingale, Bostworth & Co. These mills were operated actively for a few years supplying newsprint to local newspapers. As railroad transportation improved, competition caused them to migrate to other districts or to close.

The Pioneer Mill was the first to operate in Jefferson County, New York. It was built in Watertown in 1808 by Gordon Caswell. It was furnished with a Hollander machine carrying 150 pounds of rags, three potash kettles set in a brick arch for boiling the rags and preparing the sizing. It had a single vat for making the paper and a simple press to squeeze the water from the paper sheets. When squeezed, the paper was taken from the pack, sheet by sheet, and hung on poles to dry. Writing paper was taken from the drying poles, dipped in sizing and returned to the poles for a second drying. No steam was used, and no chlorine for bleaching. The sheets were pressed between boards in place of calendering. This mill cost about $5,000. It was purely a hand mill and employed four men and three or four women. It produced 150 pounds of paper daily. It was not worked at high speed; because rags were scarce, the demand for paper was limited and the large amount of idle hours were spent by the men in saloons. This mill was typical of many all over the eastern states at that period.

The Pioneer Mill was operated until 1824 when it was purchased by Knowlton & Rice. That firm took the machinery out in 1833 and added it to a mill they operated nearby. Knowlton & Rice became the leading paper manufacturers in the district. They bought numerous small mills and operated them until 1854 when the firm was dissolved. Mr. Rice retained interests in several of the mills. Mr. Knowlton's sons purchased, or built, other mills, operating under the firm name of Knowlton Brothers. Their Black River Mill had two Hollander machines and the first machinery for making a continuous sheet of paper. This was made over a 36-inch cylinder. The wet web of paper was at first wound on a reel, cut open with a knife and dried on poles. Later, copper driers, calenders and a cutter were added to the plant. This mill was in operation until 1848 when it was destroyed by fire. It was replaced by a larger brick mill furnished with three rag engines and improved machinery. The capacity of the new mill was 700 pounds of paper daily. This mill was replaced by a new and larger one by the same firm in 1869.

These early mills made a variety of papers to meet local demands. The same rag mill turned out ruled foolscap, letter, newsprint, wrapping, book or tissue papers. Railroad development increased the opportunities for exchange of goods with distant parts of the country and this gradually led mill men to specialize on one line of goods. In 1854, Knowlton



GEORGE BIRD

Brothers began specializing on fine writing papers. Other mills made newsprint or wrapping papers. The economic effects of this concentration were interesting to notice. They were the change from a general to a special business and often to a change of locality. Today, similar economic forces are operating and promoting a slow migration of industries to different parts of the country, as will be noticed later. The migration of mills results in the migration of labor and distribution centers.

The Remington and Taggart families were prominent paper men in Jefferson County, New York. Illustrious Remington & Sons operated a mill at Fayetteville, N. Y., which they enlarged in 1854. It had four Hollanders and one 84-inch Fourdrinier machine. It specialized on newsprint of which three tons a day were shipped.

A. D. Remington acquired a mill in Watertown, N. Y., in 1863 and in 1865 he organized the Remington Paper Company which became one of the largest American paper manufacturers. A few years later a larger plant was needed and a new mill was constructed on Sewall's Island. In this mill some of the first wood pulp machinery was introduced. This change proved most profitable. Business increased and the company greatly extended its operations.

George W. Knowlton, of Knowlton Brothers Paper Company, in speaking about the changes in the manufacture of paper in his time, told an interesting story illustrating the conservatism of business men generally. When his firm was operating, speed of machines was not of much moment. When he retired and competition began to spread, speed became of great importance. Two of the Knowlton machines had an extreme speed of 36 feet a minute. A. D. Remington was one of the first mill men to appreciate and acquire a fast running machine. He purchased one with a speed of 100 feet per minute. These speeds of the early machines are in contrast with speeds exceeding 1200 feet today.

Show Wrapping Paper

Straw wrapping paper was an early product of the State of New York. The first mill was built above Chatham Four Corners, on the Steinkill River, Columbia County. In 1826, Eleazer Cady, built a paper mill there, having a small Hollander and making paper by hand for the local trade. It was good paper. Often the small country hand mills turned out irregular products depending upon the skill of the workmen. These men were often wanderers, not staying long in any employment. They considered the vat-man to be the most accomplished in the mill. The man who could hold a molding box level so that the fiber became steady and then cast a sheet of paper of uniform thickness and evenness was looked upon as a master of the art.

Many country banks and business firms owned their own molds and water marks which they sent to the mills with their orders for paper. The molds were then returned to the owners and placed under lock and key until a new order was given.

The Cady Mill, Chatham Four Corners, was purchased in 1830 by Hamilton & Wright, mechanics and paper makers. They made a Hollander machine and made paper from straw pulp. This mill attracted attention because of its Hollander being the first to operate in Columbia County and because it used straw pulp. In 1832, Hamilton became sole owner of the mill which he later sold to Cornelius Shufelt. Rathbone & Simmons were later owners. Peter C. Tompkins, Horace W. Peaselee and Plato B. Moore were pioneers in improving the manufacture and bleaching of straw pulp and in building many wrapping paper mills.

Indiana's First Paper Mill

Indiana's first paper mill was built on Big Creek, twelve miles north of Madison, by Isaac Mooney, in 1826. Many small mills were built in other parts of the state. Most of them had brief careers. The William Sheets Mill, on Indian Kentuck Creek, built in 1827, continued in operation until 1866. The Wilson, Hanna & Barber Mill, in Lafayette, operated until 1874. The George Robertson Mill, Delphi, built in 1846, continued in use until about 1867.

Lamden & Son, owners of a mill in Ohio, in 1830, were the pioneers of the industry in West Virginia. In 1832 the Fulton Mill, Wheeling, was built by Alexander Armstrong, Frederick Trendley and others. This plant was operated by different firms until 1857.

There were numerous attempts to establish the manufacture of paper in Kentucky and other Southern states in the early days. The small mills generally had a precarious existence. The first was erected in Louisville in 1814.

The First Paper Mill in Maine

Samuel Waldo, a Boston merchant, built the first paper mill in Maine in 1731, situated on the Presumscot River, Falmouth. It was a small hand mill which was destroyed by fire in a short time. In the same district, in the same year, Col. Thomas Westbrook built a mill in Stroudwater. In later years many other small mills were operated in this state. The records show that they were not long-lived, because they were destroyed by fire, one of the greatest hazards of early mills.

A mill was built for Brigham Young in 1860 in Utah. It was made from a converted beet mill. A 36-inch Gavitt cylinder machine was purchased in Philadelphia for the mill. In the spring of 1861, the plant was completed and the first paper was made on July 24, 1861. There were two rag engines, of 150 pounds capacity, in the mill. Newsprint, book, writing and wrapping papers were made. Tinted paper for envelopes and boards were made whenever there was a demand. Quicklime was used for bleaching and rosin was the sizing material.

This mill continued with indifferent success until

the year 1863, when the machinery was moved to the new Granite Mill, which had been built at the mouth of the Big Cottonwood Canyon, 13 miles from Salt Lake City. The mill was moved owing to the failure of the water power at the old site.

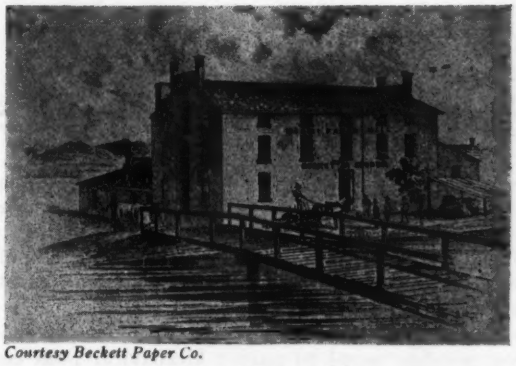
In addition to the old machinery a new 66-inch Fourdrinier machine, six rag engines, each with a capacity for 1,000 pounds of rags, a rotary boiler, together with all the recent improvements, were placed in the mill at the new site. This new mill was well constructed. It had a capacity of five tons of paper every twenty-four hours. By that time raw materials had become plentiful.

A drawback we experienced at the old Sugar House Mill was a lack of raw material. There was barely sufficient to run the machine two days a week. Cotton rags, gunny sacks and waste paper. A small percentage of woolens was used in the wrapping paper while the bulk of the woolen rags was used in making flocks for beds.

The Granite Mill continued operations until April 1, 1893, when it was unfortunately destroyed by fire. No paper is manufactured in Utah today.

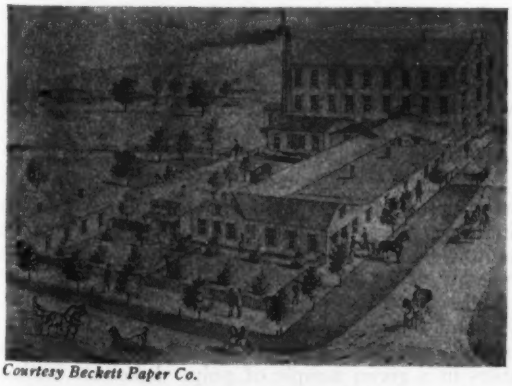
Before the Civil War, small mills catered to the paper needs of their vicinities. The war made many economic changes in the country. Old trading customs and associations were disrupted. Many of them were never restored. The seventh census shows that there were 443 paper mills in operation in 1850. Their combined capital was $7,260,864 and their raw materials were valued at $5,555,929 annually. Their products were valued at $10,187,177 yearly and they employed 3,835 men and 2,950 women. In 1859 there were still 443 mills operating, but some of these had been enlarged. Annual production was correspondingly increased. From the end of the Civil War until today the paper industry has steadily increased. Mass production by improved machinery has been the aim of mill men.

A glance at the state of the art at the end of the war period shows the final stages of the disappearance of the old methods of manufacture which met the needs of their times but which could not cope with the rapid economic developments that took place after the reconciliation. H. H. Porter of the Platner & Porter Company, Lee, Mass., specializing in fine writing papers, describing the procedure in his plant just after the war, wrote that after many experiments with paper stock a lot was made up of old papers costing ten cents per pound, four bales of hemp at six and a half cents per pound and six bales of grass rope at six and three-quarter cents per pound. The hemp and rope were chopped up by hatchets and pulped. The results were unfavorable. None of the paper could be marketed. It was found that stock composed of ledgers and account books was the best. It was thrown into a boiling vat and stamped down by the men jumping on it. Then a thick coating of soda ash, costing six and a half cents per pound was spread over it. Alternate layers of paper stock and crude soda ash were charged until the kettle was filled. Steam was turned on and the mass was boiled for thirty-six hours. A valve was opened then and the soda liquor was cast into the stream. The pulp was thrown out of the kettle by pitchforks. Large lumps of soda could be seen adhering to the wet mass. This was typical of the art just prior to the introduction of the chemical treatment of paper stocks. The scientific processes called for the employment of chemists who were instrumental in starting revolutionary changes throughout the paper industry—changes which are continuing to be made today.



Courtesy Beckett Paper Co.

BECKETT MILL IN 1855



Courtesy Beckett Paper Co.

ORIGINAL BECKETT MILL, 1848

There were many well trained men in the paper industries in the early days and in looking over the records of their work, its crudeness appears everywhere. They lived in good old days. Competition was keen, distribution difficult and costly, raw materials were scarce and financing the work was not simple. It was not these difficulties that kept the industry in its narrow groove and arrested its technological development. It was an apathetic conservatism based upon inherited prejudices which suggested that the methods employed were satisfactory and enabled good profits to be secured by hard work. There was nothing peculiar in this. In all industries, in all ages, the men who control business are routine workers. The analysts, experimenters and inventors are unusually active, imaginative and discontented men. The advance patrols of industry and of civilization are members of a small army of revolutionists.

CHAPTER V

Ground Wood, First of Pulping Processes

VARIOUS methods for pulping were developed after the discovery of the importance of wood for pulp. Five methods are of importance today—mechanical grinding of the wood; the sulphite process; the soda process; the sulphate process and numerous semi-chemical processes.

Grinding stones, rolls and other machines are used for grinding wood to pulp. Mechanical pulp contains all the constituents of the wood from which it is made and it is used in newsprint, wall and other papers that are not expected to last a long time.

Early History Not Clear

The history of ground pulp is not clear in its inception. Dr. Schaeffer published a paper in Bavaria, in 1756, in which he advocated the making of pulp from sawdust. When his ideas were placed to the test they failed on account of the poor machinery employed. A hundred years later Friedrich G. Keller discovered, like Reamur, that the nests of wasps are composed of small wood fibers glued together so as to resemble a rough kind of wrapping paper. He enlisted the aid of a mechanic, Henry Voelter, who devised a machine which ground wood to a pulp with fibers similar to the wasp's. In the sixties, French, English and later American patents were secured in Voelter's name and he and not Keller has the honor of being looked upon as the founder of the ground wood industry.

In the exhibition in London in 1862 and Paris in 1867, working plants operating the Keller process were shown. In that year, several mills employing the process were in use.

The Pagenstechers, Albrecht, Alberto and Rudolph of Stockbridge, Mass., imported two Keller-Voelter machines from Germany and employed them in their factory in Curtisville, Mass., in 1866. The Smith Paper Company purchased the Pagenstecher pulp and, finding it satisfactory, decided to use ground wood pulp exclusively on newsprint. The Pagenstechers in 1869 acquired the Keller-Voelter patent rights for the United States. The patent expired in 1884.

Albrecht Pagenstecher related that while the Smith Paper Company purchased his mill's output and were satisfied with the pulp, other mill men would not try it. Their sentiments were expressed by one as follows: "Mr. Pagenstecher we shall not take an interest in shoddy." Through persistent salesmanship, Albrecht Pagenstecher sold machinery to mills in Lawrence, Fitchburg and Lee, Mass.; Norway, Me.; and Lanesville, Conn.; which all made ground wood pulp in 1869-70. The Pagenstechers purchased water-power rights and land in Luzerne, N. Y. A mill was built and the Hudson River Pulp and Paper Company was formed in 1869 to operate it.

Other Ground Wood Mills Start

The year 1869 was memorable for the other ground wood mills that were started and later became large makers of paper. William A. Russell built pulp mills in Franklin, N. H., and Bellows Falls, Vt. Warner Miller built a large mill at Palmer's Falls and Alvah Crocker built a mill at Turner's Falls. This mill later developed into the Montague Paper Company's plant.

The pioneer mill at Curtisville produced half a ton a day. The pulp was pressed into cakes by a hand press. The larger Luzerne Mill pulp could not be treated by the slow hand press and Warner Miller suggested running it over a wet machine. This was satisfactorily done. Miller was the first to do this commercially.

Ground wood pulp sold at eight cents per pound in 1870 and then dropped to four and five cents as new mills started production. Some years afterwards it slowly declined to one cent a pound. These changes brought corresponding declines in the prices of paper. Newsprint was reduced from fourteen cents per pound, in 1870, to two cents in 1897.

When the pioneer mills, nearly all of which were financed by men who had no knowledge of the paper industry, proved successful, practical paper men began to give them attention. They attempted to avoid the Voelker patent and caused the real patent holders much litigation. Some men believed that the patent claimed the use of grinding stones. They attempted to get over this by using emery wheels, steel cutting rolls and similar devices. The patent, however, claimed the process of grinding fiber off the side of wood, because experience had shown that this is the only way in which the fibers are secured in the longest lengths.

Bagley & Sewall Build First Grinders

The first wood pulp grinding machines made in America were built by Bagley & Sewall for the Warner Miller Company Mill, at Lyons Falls, N. Y. They cost two hundred and fifty dollars each.

When Voelter's patents expired in 1884, many manufacturers of machinery built them. At this time there were many ground wood mills in operation. Competition among engineering firms resulted in many details of the mills being improved. A hydraulic feed replaced the old screw feed in 1885. Photomicroscopic tests of the pulp, when newly ground, were made so as to control the number of fibers in a given sample of pulp. Likewise methods for testing sedimentation were devised. Heating

attachments were used to increase the temperature and improve the quality of the pulp during grinding. Voith in Germany, made a magazine grinder in 1912 and the Cliff Paper Company, Niagara Falls, N. Y., in 1913 installed two of Voith's machines. Stone sharpening machines were slowly evolved for conditioning the grinders. Roberts Brothers and George C. Sherman were active in this field.

The Great Northern Grinder

About 1934 an improved type of grinder, called the Great Northern was installed in the Finch, Pruyn Mill, Glens Falls, N. Y. George K. Walker, the mill superintendent, reported that these grinders are paired into four lines, each line operating with 2400 h.p. The stones are running at 220 r.p.m. controlled by Meyer governors, under a pressure of 52 pounds and manufacturing approximately twenty tons of pulp per day at 55 to 60 h.p. per ton. The grinders are equipped with Taylor temperature controls which eliminate manual supervision. The operating crew for the pulp mill with this set-up of grinders is four men per tour, against the old method of grinding which required eighteen. The time required to change stones is comparable to the old three-pocket type of grinders. The position of the hydraulic lathes at the top of each grinder, lending easy accessibility to burring the stones, is another good feature of these units.

The grinders are equipped with artificial stones, on one grinder we have a Carborundum 56 grit, and the remaining seven stones are four Norton 60 grit, three 50 grit. The present application of burrs to the face of the stones has reduced our stone cost to 6½ cents per ton, and by actual measurements we find our stone wear is approximately 1/16 inch per month. The burring cycle of all the stones for the last three months operations has averaged 117 hours between sharpenings, against the old method of burring each stone once every eight hours. After burring, the pits and stone surface are always carefully washed to eliminate the grit present.

Albrecht Pagenstecher

Curtissville Mill, Where First Ground Wood Was Made.

It is estimated that, in the United States, mills producing about forty per cent of the newsprint are using Great Northern Grinders.

The Sunnydale Mill

The excellence of the machinery built for mills by our engineers is shown by the story of the Sunnydale Mill, Newark, New Castle County, Del., was celebrated for its old paper machine, a relic of olden times. It was a small mill built and operated, in 1811, by John Farra, and later by his son Daniel. Several times it was destroyed by fire. In 1860, it was purchased by Francis Tempest who operated it until 1901 and he was succeeded by Edwin Garrett. This historical mill was operated until 1930 and was dismantled in 1933. Its last owner was the Beaver Valley Paper Company and its output was 2,000 lbs. of paper per 24 hours. From its inception to its end its power was both hydraulic and steam. Its motive power was not changed during its one hundred and eleven years of activity.

In the longest period of its career, this mill had in operation a single one-cylinder paper machine, 36 inches wide. At different times it made different paper. Its chief output, however, was tissue. The width of this machine limited the output throughout the years to 1000 lbs. per day until 1901 when a larger machine was added which doubled the capacity.

American Leads Speed Development

It was shown in 1873 that the output of a paper machine depends upon the area of its cylinder and its speed. Carl Hofmann demonstrated this in his well known book in 1873. Thereafter, American engineers led the way in developing its speed. The Smith Paper Company, Lee, Mass., had machines built in 1866, with a speed of 100 feet per minute. They were successful. The Glatfelter Mill, Spring Forge, Pa., ordered a machine to be built by the Pusey & Jones Company in 1880. It was a 100-inch machine making 94 inches of paper. This was two inches wider than the Smith Mill's. The speed was 200 feet per minute. That was double the average speed in 1867 and three times greater than the speed of the Sunnydale Mill.

Warren Curtis designed a machine with a speed of 250 feet per minute. The Fourdrinier part of this machine was 112 inches wide, the wire was fifty feet long and it had fifteen driers, each of 48 inches in diameter arranged in two tiers, nine below and six above. The Hazard swinging arm pressroll housing was invented for this machine. It was purchased by the Hudson River Pulp and Paper Company and was by far the finest and most efficient machine built in that period.

The Pusey & Jones Company built machines for the Palmer's Falls and Glens Falls Paper Mills, between 1885 and 1895, which were improvements on the Hudson River Company's machine. The speed was 250 feet per minute. The mill engineer, Charles Bragg, believed the machine could be run at a speed of 300 feet per minute. He was able to secure that speed by furnishing it with improved felts.

The next forward step was taken in 1897 when five machines were built by the Pusey & Jones Company for the Glens Falls, Hudson River, the Palmer's Falls, New York and the Glen Manufacturing Company, Berlin, N. H. These machines had a speed of 500 feet per minute.

Endeavor to Increase Output

In 1868 and earlier, the speeds of several sections of paper machines were varied by adding to or taking away canvas strips to the faces of the driving pulleys. The machine tenders were constantly engaged with canvas and glue pot in adjusting these strips. To avoid that annoying labor, an expandable pulley was invented and patented in 1869 by Thomas Lindsay, engineer of the Augustine Mill, Wilmington, Del. It was a success and in later years it was improved by the makers, Pusey & Jones.

Houffray, Cadet & Sons, of Paris, patented a cone pulley in 1877 which, operating with bevel gears, revolutionized machine drives. They were widely adopted in European mills. American mill owners refused to recognize their merits. They objected to cone drives because they required the use of a pair of bevel wheels for each section of a machine. What American paper men wanted was increased output of paper per machine. Expanding pulley speeds were increased to the extent that it became difficult to vary their sizes. The cone drive obviated these difficulties. They could be easily adjusted at any speed. They also could be operated by narrower belting. George E. Marshall, of Turner's Falls, Mass. secured a United States patent for the cone pulley. It became known as a Marshall driving train.

In recent years, sectional electric drives have been successfully operated in large mills. A new drive incorporates a variable pitch V-belt in the drive to take the place of cone pulleys. It is called the Sandy Hill selective drive.

CHAPTER VI

Introduction of Chemical Pulping Processes

THE introduction of the chemical processes in manufacturing wood pulp resulted in one of the greatest and most stimulating revolutions in the development of the paper industries. The earliest pulping method by chemical means was patented in England in 1852 by Hugh Burgess, of Reading. Several years before Burgess and Charles Watt, in a mill in Boxmoor, Hertfordshire, had made excellent white book and writing paper from wood pulp. The process was thoroughly tested commercially before the patents were issued. Burgess arrived in the United States in 1854 and secured American patents. He made the first wood pulp into paper in the Warren Mill, in Maylandville, Pa. in 1855. Later in that year Burgess built a larger mill at Royer's Ford, on the Schuylkill River, and managed it until 1895.

Burgess' Work Not at First Appreciated

Burgess' great work was not at first seen to be valuable by American paper manufacturers. A few, like the Megargee Brothers, Jessup & Moore and Matin Nixon, realized that it could be used for print paper. But the majority remained for some years strongly prejudiced against the process.

The mills using the Burgess process discovered that it enabled them to use, besides rags, many cheap materials. Tests were made of spruce, fir, hemlock, the stem or bast fibers of many plants, flax, straw, hemp, corn and cane stalks, bamboo, sisal, pineapple leaf, cocoanut and many other organic fiber-bearing substances, with good results.

In later years, when new mills were being planned, the class of materials for pulping were studied with these major factors in view: (1) Dependability and extent of supply, (2) The cost of Distribution, (3) The cost of storage, (4) The seasonableness of supply, (5) The deterioration of supplies in storage, (6) The yield of suitable fibers per ton, and (7) The cost of preparation of the fibers for pulping.

The use of wood pulp as a basis in the paper industry caused changes in the geographical distribution of the mills. Pennsylvania, New York and, later, New England mills developed the pioneer mills; because they were best suited for distribution purposes and also to the supplies of rags. When wood-pulp supplanted rags, mills were built in Wisconsin, Michigan, Minnesota and other northern and mid-western localities. Later the forests of the western and Pacific north-western states were drawn upon for pulp supplies. In 1920, the Southern states were encom-

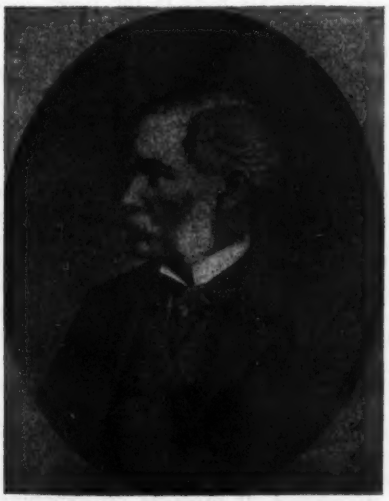
passed in the pulpwood supply field. While the trend of mill centers has been definitely towards the locations of the great forest areas, the industry in the old pioneer states continues its strong development. The new fields have failed to displace the old.

Hugh Burgess was the pioneer developer of commercial pulping of spruce. It should, however, be remembered that the effects of soaping, acid and alkaline solutions on wood were familiar to the alchemist many centuries ago. Numerous European chemists in the eighteenth and nineteenth centuries demonstrated the effects of acids and alkalies on wood. Science generally blazes trails to new chemical processes many years before an inventor applies a process to a commercial use.

First Important Use of Burgess Process

The American Wood Paper Company, in Manayunk, Pa. was the first important company to use the soda pulp process of Burgess. It was established in Philadelphia in 1865, by Embree & Egolf. When Bloomfield H. Moore died, in 1876, the Jessup & Moore firm was dissolved. The surviving partners, in 1877, incorporated the Jessup & Moore Paper Company. It built the Delaware mill in 1879. The mill was not operated until 1881. The company was dissolved in 1884 as a result of the failure of the directors to run it profitably.

The S. D. Warren Company, Cumberland Mills, Me., actively experimented with soda pulp in 1875-6 and subsequently employed it. In Holyoke, Mass., D. H. & J. C. Newton had a soda pulp mill in 1878. Martin L. Griffin, a consulting chemist, related that in 1883 he was called to the office of the Newton Mill by Daniel Newton, the manager. "Mr. Griffin" he said "we are having many difficulties with our customers over moisture in our pulp. I want you to come to the mill every morning and evening and sample the pulp. Take fifteen or twenty pounds each



HUGH BURGESS

S. D. WARREN

sampling—no homeopathic samples for me." That was one of the first references in the records to the annoying problem of pulp moisture. The practically important characteristics of wood pulps are quantity and quality of fibers and the degree of resistance of the cellulose to alkaline hydrolysis and oxidation. This necessitates careful sampling of the pulp, the chemical estimation of the contained moisture and the correct proportioning of the treatment liquors.

Poplar Wood First Used for Soda Process

The first pulpwood used in the United States for the soda pulp process was made from poplar and aspen logs. Barking was done in the wood yard by men with draw shavers. Later on, the wood was cut in the forests and stripped of its bark during the sap growth period.

The liquor mixing process has undergone many changes. In 1885, black ash and lime were dissolved in water, the solution was boiled and passed through a filter of coal-ashes. The alkali, in a later time, was leached out in open tanks furnished with false bottoms. This method was followed by leaching in a series of closed diffusers. It was followed by a system of continuous filtration.

The value in controlling moisture in pulp is demonstrated in straw mills. Straw cellulose has a strong capacity for hydration, or water absorption, and partial gelatinization when submitted to the action of beating. Wetness in pulp results in the qualities of hardness and "rattling" in finished paper as is illustrated by straw pulp papers.

The Jessup & Moore mill was furnished with direct fired stationary digesters for cooking purposes. It was a simple boiler with a coal fire at its base. The Newton digesters followed. They were vertical stationary boilers heated indirectly by steam coils surrounding the interior wall of the digester.

The Mechanicville digester was subsequently developed. It has a large steam-coil heated dome. The

cooking liquor was pumped through the dome in its passage through the boiler.

Upward and downward circulation of the cooking liquor were tried and had their advocates. Live steam discharged into the digester through an injector was an early practice in the Ticonderoga and Willsboro Mills. The time of cooking has been improved. It is now less than half what it was in the early soda plants. In other respects the preparation of the leaching solutions had not been modified in any important respects.

Recovery System Greatly Improved

The recovery system has shown the greatest improvements and it has been suggested that it is the efficiency of the recovery methods that is continuing to support the soda pulp processes. The pioneers evaporated the black liquor in open pans. In the Ticonderoga Mill, Ticonderoga, N. Y., the pans were arranged in a vertical stack. They were fired direct from a furnace below. The hot furnace gas was carried around and over the pans. The liquor was pumped into the pans counterwise to the direction of the evaporating gas streams.

The Mechanicville, N. Y. Mill treated its liquor in two long pans set in a brick furnace. The pans were fifty feet long and were set within the brickwork tandem wise one above the other. The plant was operated like an iron-puddling furnace. The black ash was pulled in flaming masses from the side doors of the furnace while the organic matter was incinerated. Two important improvements were made in this process in 1888. A multiple effect vacuum pan, like that used in sugar refineries, was suggested by H. T. Yaryan, Toledo, Ohio, whose improvements in film evaporators benefitted several of the large chemical industries. Colonel A. G. Paine formed a syndicate and purchased the patent rights for the paper industry to reclaim soda ash. The syndicates investment proved very profitable.

B. B. Taggart

The introduction of the rotary kiln, similar to what had been employed in the metallurgical industries, in cement manufacture, and in many roasting operations, made the second great contribution to the improvement in the recovery of the alkali from the used liquor. The rotary furnace comprised a steel cylinder ten feet in diameter, sixteen to twenty feet in length, which had a brick hearth or firing unit at one end. The interior of the cylinder was lined with fire-brick. Waste heat from the furnace was employed to feed a boiler to raise steam for evaporating the water in the spent solution. The operation of the furnace was almost automatic. Before these improvements were made, recovery costs amounted to fifty cents per hundred pounds of recovered alkali. This was reduced to five cents per hundred pounds.

In some works the soda is leached from the soda ash so as to leave only a black, finely divided carbon sludge. This is usable for filtering or decolorizing purposes.

Causticizing results in converting carbonate of soda into sodium hydroxide or caustic soda. Chemical engineers have developed machinery for this purpose to a high degree of efficiency. Numerous processes are used. The Dorr Continuous Causticizing System is extensively used. It has been adopted from the metallurgical industries to the paper industry. It furnishes a continuous method resulting in saving labor and power costs and in reducing losses in charging, agitating, decanting and washing.

Bleaching, in the early days, was done in a crude manner by passing the liquors through the paper engine and wooden or brick vats. Later, tanks arranged in series, through which the pulp flowed by gravity or was pumped, were employed.

Great Improvements in Chemicals

Great improvements were made in the processes for making chemicals used in the paper making industry. During the first century, soda ash, caustic soda and bleach were made by the LeBlanc process. The Solvay process was patented in 1861 and was used in many plants. The first Solvay plant to operate in the United States was built in Syracuse, New York, by Roland Hazard and William B. Cogswell, in 1881. In later years, the Ernest Solvay process furnished the bulk of the chemicals employed in the manufacture of paper. Its development, however, was as usual slow. Old prejudices were difficult to overcome. In 1883, a questionnaire was sent to the managers in the leading mills to learn their opinions of Solvay ash. The opinions varied. The conservatives were most numerous. Their opinions were summarized by one of them as follows:

"We tried Solvay ash for three months and lost money. We work so carefully that mistakes are impossible". It was that excessive care or timidity that was responsible for so many paper mills failing within a few years after beginning work. Business is always speculative. It prospers on experiments and venturing, it declines from the use of excessive care,

fear or conservatism. This applies to all forms of business. The history of the manufacture of paper shows that a large proportion of its failures were due to the management's reluctance to take risks when they were available.

The application of electrolysis in the chemical industry led to improvements and economies in the paper industry. The Little-Warren, The Carmichael, the Allen-Moore, Castner, Hargraves-Bird, Townsend, Larchar's, Nelson and other electrolytic cell processes were experimentally tried in the United States.

The recovery plants aimed exclusively at recovering the soda. It is well-known to works chemists that the spent liquors contain many other chemicals. Attempts have been made to recover other valuable products from them by electrolytic means and by fractional distillation. Some progress in this field has been made, more is ready for accomplishment. Today, little is known about the complex mixture resulting from the various reactions which occur during the cooking process. One difficulty experienced in the recovery is that waste products in the spent liquor are in diluted form. The solids amount to only 10 to 12 per cent of the total liquor weight.

It is shown that when the liquor is highly concentrated it has adhesive properties which have fitted it for use as a road binder, for a core binder in foundries and for briquette binding. It can be used also for sizing material for paper, as a tanning substance, and numerous other purposes. The possibilities for making drugs and fine chemicals from the liquor are indicated by the fact that analine and sulphur dyestuffs have been obtained from it. Ethyl alcohol is secured from it by several methods now claiming attention. A yield of 95 per cent alcohol amounting to about one per cent by volume of liquor is easily obtained. Much has been done on these lines.

Another use for recovery material, which has been applied for many years in cruder forms, is in heating. While most attention has been given to the recovery of the chemical contents of spent liquor from the chemical processes of pulp making, engineers have experimented with the utilization of the thermal values efficiently. Steam is an essential requirement in producing chemical pulp. It is used in cooking for the concentration of the black liquor, in causticizing operations and for other purposes. Fuel savings can be secured by using the incineration of the black liquor in steam generation. The thermal value of black liquor is low. It is less than 33 per cent of coal. Its ash contents are about three times as large as that of coal. Its moisture content is always high. Nevertheless, the economic importance of the liquor fuel value has led engineers to conduct extensive experiments and they have demonstrated that when used in modern water tube boilers, recovered soda ash can be profitably employed for fuel purposes.

THE ALPENA MILL, A PIONEER SULPHITE MILL

In glancing over the development of the chemical pulp processes we see how much their efficiency has been increased since they were first introduced and we can convince ourselves that finality has not been achieved. They are destined to play greater roles in the manufacture of paper. They will continue to assist in the development of the industry.

CHAPTER VII

The Development of the Sulphite Process

CHEMISTS have been busy making experiments since the Middle Ages. Many of their results were published. The majority of experiments, even many of a most interesting character, were never reported. Each year hundreds of thousands of inventions are made; but only an insignificant number are ever used in industry. Frequently principles in chemistry and mechanics are discovered and rediscovered. So, it was with the chemical processes now employed in the paper industry.

A patent was issued to a Frenchman, L. Piette, in 1830, for the use of a method of bleaching straw for papermaking with sulphurous acid. This is the earliest record of the use of sulphite of sodium in the paper industry.

Peter Claussen, an English inventor, was granted a United States patent for making straw pulp by soaking the straw in an alkali and treating the wet material with sulphurous acid gas. The patent was issued in 1851. There is no record of any commercial application of the process being made.

Tilghman, the Pioneer

It was the American chemist, C. B. Tilghman, of Philadelphia, Pa., who first drew attention to the value of the sulphite process. While experimenting with fats, he found that sulphurous acid attacked his wooden vats. The alchemists centuries before him had noticed that all the sulphur acids softened and

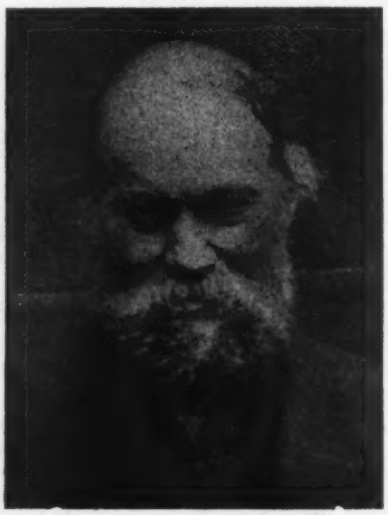
changed the color of wood. But Tilghman, knowing the difficulties that were being experienced by paper makers in securing supplies of rags experimented in making wood pulp. When he found he could secure a suitable pulp, he built a small wood pulp mill in the paper factory of W. W. Harding & Sons, Manayunk, Pa., in 1865. He used a water solution of sulphurous acid which formed sulphuric acid. The sulphuric acid broke down the fibers in the wood. To prevent that he added a solution of lime to the acid. He demonstrated the effectiveness of the sulphite pulp process and secured U. S. Patent No. 70,485 for manufacturing wood pulp by treating it with solutions of calcium bisulphite or other bases. This was the first American Patent for a commercially useful process. Mechanical difficulties impoverished the inventor.

The Tilghman Patent Specifications

How well Tilghman employed the process is shown by his patent specification. It claimed:

1. The process of treating vegetable substances which contain fibers with a solution of sulphurous acid in water, either with or without the addition of sulphites or other salts of equivalent chemical properties as above explained, heated in a close vessel under pressure, to a temperature sufficient to cause it to dissolve the intercellular incrusting or cementing constituents of said vegetable substances, so as to leave the undissolved produce in a fibrous state, suitable for the manufacture of paper, paper pulp, celluloose, or fibers, or for other purposes, according to the nature of the material employed.
2. I also claim as new articles of manufacture the two products obtained by treating vegetable substances which contain fibers with a solution of sulphurous acid in water, either with or without the addition of sulphites or other salts of equivalent chemical properties as above explained, heated in a close vessel, under pressure, to a temperature sufficient to cause it to dissolve the intercellular or incrusting constituents of said vegetable substances, one of said products being soluble in water, and containing the elements of the starchy, gummy, and saline constituents of the plants, and the other product being an insoluble fibrous material, applicable to the manufacture of paper, cellulose, or fibers, or to other purposes, according to the nature of the material employed.
3. I also claim the use and application, in the manufacture of paper, paper pulp, cellulose, and fibers, of the fibrous material produced by treating vegetable substances which contain fibers with a solution of sulphurous acid in water, either with or without the addition of sulphites or other salts of equivalent chemical properties as above explained, heated in a close vessel, under pressure, to a temperature sufficient to cause it to dissolve the incrusting or intercellular constituents of said vegetable substances.
4. I also claim the use and application of sulphites or other salts of equivalent chemical properties as above explained, in combination with a solution of sulphurous acid in water, as an agent in treating vegetable substances which contain fibers, when heated therewith in a close vessel, under pressure, to a temperature sufficient to cause said acid solution to dissolve the intercellular or incrusting constituents of said vegetable substances.
5. I also claim the recovery and re-use of sulphurous acid and sulphite from the acid liquids which have been digested on the vegetable fibrous substances, by boiling said liquids or neutralizing them with hydrate of lime.

Tilghman digested the wood chips in lead-lined iron tanks. These were not found to be practical and the use of the process remained in abeyance for several years until other inventors improved its mechanical details.



BENJAMIN C. TILGHMAN

Some Interesting History

R. B. Griffin and A. D. Little, the first American chemists to specialize in the chemistry of paper making, grew up with the development of the sulphite industry in the United States. In their work on the Chemistry of Paper Making, they give a clear account of the historical facts. The following is an abstract:

Tilghman is said to have spent about $40,000 in experiments at a mill at Manayunk, Pa. He boiled in long ten-inch cylinders, lead lined. Although excellent fiber was obtained, the engineering difficulties proved so serious that the experiments were finally abandoned.

After the failure of Tilghman to put his process upon a commercial footing it was taken up by Fry and Ekman, at Bergvik, Sweden, about 1870, after a course of experiments in which nitric and various acids and water alone had been tried as resolving agents. In 1872, the present Ekman process, using

a solution of bisulphite of magnesia, was so far developed that these gentlemen had a three-ton mill running on a commercial basis with eight small jacketed digesters. The process was worked secretly until about 1879. It was introduced into England in a small way at Ilford Mills, near London, after which, in 1884, the proprietors of the patent erected a large mill at Northfleet, also near London.

Although in no way essential to his process, Ekman has always favored the preparation of this solution in towers. Those first used at Bergvik were five feet in diameter, fourteen feet high, and filled above the false bottom with calcined magnesia. They carried at the top sprinklers for distributing and regulating the flow of water.

The next to assist in the development of the process was Mitscherlich, then professor of chemistry at Münden, and a son of the celebrated discoverer of the law of isomerism. He began his experiments at the mill of F. Keferstein, Ermsleben, near the Hartz Mountains, about 1876, and later went to Thode's Mill, near Dresden. He did not get started on a commercial scale until about 1880 or 1881.

On the 11th of October, 1883, Moritz Behrend, the lessee of Prince Bismarck's mill at Coeslin, disputed the validity of the Mitscherlich patents. He relied chiefly upon the Tilghman British patent, No. 2924, dated Nov. 9, 1866. After a very long trial and examination of technical experts, the German Board of Patents concluded that the Mitscherlich process did not differ from that of Tilghman sufficiently to entitle it to protection.

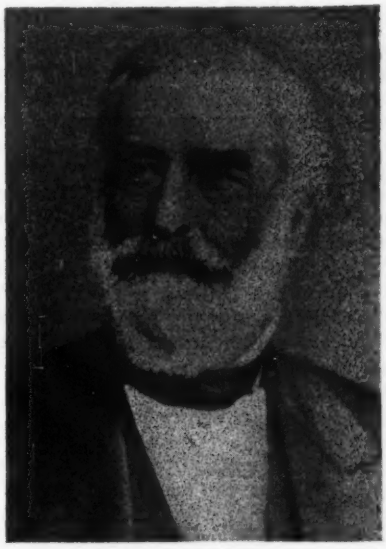
Francke, in Gothenburg, Sweden, began his experiments about 1879, his attention, it is said, being turned in this direction through the introduction to him of one of Ekman and Fry's chemists. He began work in a commercial way about 1882. His process secured no foothold in this country, and presents few points of interest. The liquor is prepared in towers, and the digester is a horizontal rotary cylinder, lead lined. The lining is held in place by rings of various construction.

The Partington process, which was acquired by the American Sulphite Pulp Company, about 1884, was one of the first to be introduced here. The liquor plant shows a radical departure from those previously used. The digesters are spherical rotaries. The various steps taken by Partington in the development of his system for lining these digesters comprise one of the most interesting studies in engineering which the process has shown.

McDougall was for some time associated with Partington, and his plant in 1887 differed little from the last described, except in the method adopted for lining digesters.

Graham's Process

Various other manufacturers in different parts of Europe started almost contemporaneously with these workers. Graham in England, who had been chemist to Ekman and Fry, applied to digester linings a method by which the lead was caused to adhere uniformly over the surface of the iron shell, and worked



MARTIN NIXON

out a special modification of the Ekman process. It consisted in reinforcing the strength of the boiling liquor during cooking by fresh charges of gas. Graham's process has not come into practical use, but the digester was adopted by Ekman, and by some mills in this country. Flodqvist for a time exploited the process in which a liquor containing both bisulphite and phosphate of lime was used, the liquor being made in a series of towers, some of which were packed with limestone and others with the bones which furnished the supply of phosphate. Kellner in Austria, was at that time associated with Baron Ritter. He was one of the most skillful chemical engineers who turned attention in this direction. He had taken out, in 1885, several patents covering a special process, liquor apparatus and digester, which were then in successful operation.

The difficulties occasioned by the use of an acid sulphite had, as early as 1880, led Cross to bring out a process employing an alkaline solution of sulphite of soda in iron digesters, unlined. This reagent has no effect on the iron, but its use necessitates the carrying of considerably higher pressures than where the bisulphite is used, the bleaching action of the sulphurous acid is much restricted, and the cost of chemicals much increased. There is, moreover, according to experiments, a precipation under these conditions of free sulphur throughout the pulp. The Pictet-Brelaz process, which was brought out in 1883, goes to the other extreme. Instead of increasing the amount of base, as Cross had done, it does away with it altogether, the wood being boiled at a temperature never exceeding 105 deg. C., in a solution carrying from 7 to 8 per cent sulphurous acid.

Charles S. Wheelwright Introduces Process

The first American paper maker to introduce the

process upon a commercial scale in this country was Charles S. Wheelwright, then of Providence, R. I. The Ekman process was the modification selected, after a visit, in 1882, to the small mill in which it was in operation at Bergvik, Sweden. Although the process as there shown was evidently very imperfect on the mechanical side, the high grade of the product encouraged Mr. Wheelwright and his associates to erect, on a large scale, the now historical plant of the Richmond Paper Company.

Pulp of the highest quality was made almost from the start; but the mechanical difficulties of working the process on a large scale proved so serious that in spite of his untiring energy, Mr. Wheelwright soon found himself in almost the position of the original inventor, Tilghman.

The towers filled with calcined magnesia, as was the case at Bergvik, gave endless trouble. It was due to the difficulty of regulating the flow of water, from the great tendency of the magnesia to soften up and form mud, and finally, from the liability, when the water supply was temporarily stopped, of the whole mass to cake and bind together through the formation of monosulphite of magnesia. These defects in the apparatus frequently made it impossible to secure regular or free draft up through the tower, the output of liquor was small, and both its quantity and composition were irregular. After trials on a large scale, with many different forms of apparatus, those difficulties were entirely overcome by the adoption of the apparatus suggested by Catlin. Obstacles equally serious were encountered in working the digesters, as the engineering problems presented were such that no precedents could be found for guidance. Various forms of digesters were designed in succession by Mr. Wheelwright to such good effect that the cost of repairs on linings were in about three years reduced from over $10.00 to about $1.50 per ton of product. Throughout all this period of difficulty the product of the mill was equal, if not superior, to any which has since been produced here or abroad.

Except in a few instances which will be noted, the subsequent developments of the process in this country has proceeded upon the lines laid down in Europe, although numerous forms of digesters and liquor apparatus have appeared. Two new systems, those of Schenck and Crocker, have been developed commercially, and the former has been widely introduced. The main novelty of the Schenck process is found in the digester, which is built up in three-feet sections cast from a special bronze. His liquor apparatus differs slightly from that of Partington, and the general method of procedure in the process itself is much the same. The Crocker process differs from all those before mentioned in that it employs a solution of bisulphite of soda prepared by double decomposition on treating bisulphite of lime solution with sulphate of soda.

The First Sulphite Mill in U. S.

The first sulphite mill in the United States to operate successfully on a commercial scale was built in Alpena, Mich. in 1887 by G. N. Fletcher. It was a Mitscherlich mill. The construction was supervised by August Thilmany who secured the American rights of the Mitscherlich patents in 1885. These rights were sold for $250,000 to the International Sulphite Fiber and Paper Company, Detroit, Mich. That company charged a flat royalty of $10,000 to each mill employing the process. The Sulphite-Fletcher Paper Company at Alpena closed in 1940.

In the early days of the sulphite process, operators found difficulties in preparing the wood for the digesters. The wood was cleaned by hand, the knots were cut out and the logs were cut into small discs that were hand-charged into the digesters. This was slow and costly. An improvement was made when the hand-cleaned logs were sliced into uniform sized chips by a guillotine axe. Subsequently slasher saws, barking drums, splitters, and high efficiency chippers were developed.

The development of the acid plant was the most difficult problem faced by the pioneers. Griffin and Little's account shows how the inefficient, evil smelling, hard-in-handling acid chambers were gradually improved.

Endless difficulties were experienced in the early days in constructing digesters which would withstand the solvent action of the sulphur acids. Iron digesters are corroded and pitted in less than six months. Within a year or two, they must be replaced.

Experiments showed that lead is the only metal that resists the corrosive effects of the soda acids, and lead possesses certain physical characteristics which are undesirable. The resistance of lead is due to a protective coating of lead sulphate over its surface which completely resists the action of the sulphite liquor. But lead has a coefficient of expansion which is more than double that of iron or steel. This results in the lead tearing away from steel when the two metals are together and the temperature is increased. Besides, lead, when expanded by heat, unlike most metals, fails to return to its original dimensions. Consequently, when iron and steel digesters were lined with lead, the lining "crawled", buckled and pulled away from the steel shell of the digester. In the course of time, this action of the lead lining results in cracks, pitting and tearing of the lining with corrosion of the iron.

Much Ingenuity Manifested

Much ingenuity was manifested by inventors in overcoming the decaying of lead linings. Some tried to make use of lead alloys. It was discovered that small quantities of antimony, tin, or copper alloyed with lead improved its contraction qualities.

One of the earliest patents for antimony-lead linings was that of Frank. The alloy was cast in half-circles which were placed in position within the steel digester shell and melted together into a solid lining. A later patent of Frank's covered the use of brass with lead. The rings were cast of brass and covered with lead. A further improvement was made by casting the brass rings in three segments which were

kept in position by tightening wedges made of lead covered brass. When the lead covering of the rings diminished in thickness by wear, the lining was tightened by hammering the wedges. Experience showed that the constant tightening of the rings squeezed the lead away from the lining and this necessitated constant repairs. Better results were secured by making the rings of wrought iron strips about two inches wide that were cut into half circles and sprung into place within the digester. The rings were placed a foot and a half apart and covered with lead which was burned on within the digester to form a continuous surface.

Partington, patentee of the globe shaped rotaries, cut the lining out of spherical triangles of iron which he covered with lead. The lining was held to the steel shell with large-headed bolts. The bolts were lead covered and the lead was fused into a whole.

Makin patented a lining made of thin sheet iron boiler plate perforated with half-inch holes. Lead was cast over the plate and filled the perforations. Numerous modifications of this lining were made to overcome working difficulties.

Springer modified the Partington lining by allowing spaces to remain between adjacent edges of the lining sections. The Ritter-Kellner lining was of iron covered by lead with lead rings sunk in the digester walls. The interior surface, when the rings were in place, was covered by lead sheets which were fused into a solid mass.

The Ekman, a Swedish invention, had recesses in the steel shell into which fused lead was forced. This construction was a fertile source of repairs and the patents earned no profits in the United States.

Wheelwright's linings took the place of Ekman's. The inventor built this digester of cast-iron rings, 7 feet in diameter and 2 feet high. There were ten rings and the digester had cast-iron cones at top and bottom. The inner wall of each ring was ingeniously curved outwardly towards the flanges. This tended to cause the lining to bed itself on convex curves while expansion was neutralized by expansion through the flanges.

So much trouble was given by lead-linings, that experts sought how to make linings from bronze. These were a little more satisfactory, but in time, corrosion appeared in the lining. Pitting, on numerous occasions, led to serious digester explosions. These led to the fitting of Clapp and other safety-valves to digesters.

The Mitscherlich digester was the first to use bricks for a lining. It was a German invention which gained much attention, a brief popularity and a short life. It was built of steel cylinders about fourteen feet in diameter and forty feet in length. The interior of a cylinder was coated with tar and pitch which was employed as a cement to hold a lining of sheet lead. The lead was covered by two-courses of a special acid-resisting brick interlocked by tongue and groove. Piping measuring 2,000 feet was coiled within the digester to steam heat the contents. Great efforts were made to improve the efficiency of this process, but without avail. The operations proved to be too long, often requiring as much as sixty hours. The copper heating coil constantly leaked and called for repairs which led to the closing of the digester. The lead pipes attracted deposits of calcium monosulphide which, when heavy, dropped into the pulp and injured it. Overcooking occurred, when the wood chips were in contact with the copper heating pipe coils.

Numerous other factors worked against the extensive use of the Mitscherlich Process, but it is not without certain beneficial attributes that make it desirable in some factories. It makes a characteristic, strong pulp which is not matched by any other method. It does not consume much sulphur and a weak acid can be used. Where these are desirable conditions to be met, the process may prove satisfactory.

An accidental observation made in 1883 by a chemist resulted in the patenting of the Solomon Brungger digester in Germany. When bronze coil repairs in a Mitscherlich digester were necessary, Brungger used iron coils instead of the bronze ones. At the end of the cooking, he saw that the iron coils were coated with a thin dense scale of lime sulphite that prevented corrosion. He experimentally found means for coating the whole of the interior of the digester with a film of the sulphite. This was patented and was known as the Solomon-Brungger digesting process.

The Jung & Lindig process used a lining of a double silicate of iron and lime which was covered with a protective shield of silicate of lime. Other chemical linings were tried and many had advocates. Deposited linings were made obsolete when cement linings were tried. Wenzel, in Germany, was one of the pioneers in cement linings. He covered the interior of a digester cylinder with metal lath which was covered with Portland cement. In 1890 Kellner and others took out international patents for cement linings put on in plastic condition, or cast as rings, blocks or slabs. The Portland cement was mixed with powdered slate, glass and other materials. Kellner was the first to use and patent glass linings. The glass was cast in slabs, or rings, to fit the digester. Russell discovered that a cement and sand mixture did not hold up. The Alkali and acids attacked the sand. He found pure Portland cement made a better lining. Cement linings are porous when new. After a few cookings they absorb coatings of lime sulphate and sulphide.

Brick and tile were used to protect cement linings. They proved efficient and linings of brick and tile alone were tested and found to be practically useful.

The chief objection to cement, brick and tile linings is that they do not provide a covering of uniform thickness. Where there are thin, porous spots, acid penetrates and corrodes the steel plates.

The bisulphite liquor used in the digesters is prepared by (1) burning pyrites or pure sulphur; (2) absorption of the resulting sulphur dioxide gas in a solution of lime in water and (3) adding the sulphur dioxide recovered from the previous cooking to fortify the new liquor.

CHAPTER VIII

Sulphate Process Makes Appearance

THE soda process was modified in 1884 by C. F. Dahl, a chemical engineer of Danzig. He sought a means for reducing the cost of the soda process and discovered that by using salt cake, or sodium sulphate, in place of the costlier soda ash, he not only got a cheaper pulp, but also one with long, strong fibers. It was a better process than the older soda method. There were enormous heaps of sawmill refuse in the forests of Finland, Norway and Sweden which were suitable for treatment by this new process. The refuse was secured by paper manufacturers. Dahl's process was used in converting it into paper. This activity led to an extensive development of the process, on account of the low cost of paper made by it in the early days through the relatively low price of the salt cake and refuse. Later, when the refuse reserves were used up, there was a reaction to the process on account of the foul odors it made. Carl Carlson, a Swedish engineer, observed that when the pulp is cooked in a closed digester under pressure, the odor nuisance could be greatly minimized. He patented the idea, built a plant and received orders for the construction of mills in Europe and the United States.

Sulphate Mills in Europe

Sulphate mills were largely developed in Europe in 1886. Carlson had built and operated the Oerebo and Langbrun mills in Sweden. Here he demonstrated the value of the process to European mill men and those mills became the centers of pilgramages of American paper manufacturers who "wanted to be shown that the process worked before they would put money into it." This conservative attitude enabled Canada to secure the honor of building the first sulphate mill in America. In 1908, the Brompton Pulp and Paper Company, which was formed in 1903, had a sulphate mill in operation in East Angus, Quebec, Canada in 1907.

The president of the Central Paper Company, Muskegon, Mich., visited Carlson at Langbrun, Sweden, in 1908, to study the sulphate process. He became enthusiastic and said he was convinced that in the future it would be the basis of the American wrapping paper industry. A contract was made with Carlson for the design and construction of a sulphate, or kraft mill, in Muskegon. This was the first to operate commercially in the United States.

The digesters and diffusers in the Central Paper Company's mill were made by Julius Pintsch & Co. in Berlin, Germany.

The first sulphate pulp made in the United States appears to have been obtained in an experimental mill in Pensacola, Fla. in 1903. It was built and operated by Smith & Thomas as a sulphite mill and it was changed to sulphate by their chemist, Edward H. Mayo.

The first commercial mill to manufacture sulphate pulp in the United States it is stated was that of the Roanoke Rapids Paper Manufacturing Company, Roanoke Rapids, N. C., which went into production on February 26, 1909.

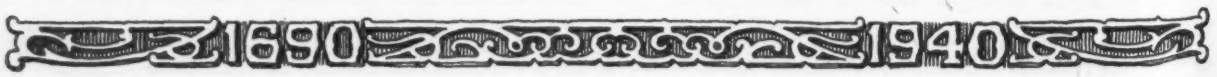
First Sulphate Pulp in U. S.

The records however concerning the priority of the establishment of the United States sulphate mills are not clear. There is no doubt that the honor belonged to either the Muskegon or the Roanoke. The engineer who constructed the Roanoke said that the first cook was blown in on February 26, 1909. Mr. E. Meurar, president of the Central Paper Company when the Muskegon Mill was built, published an article in the PAPER TRADE JOURNAL in which he stated that: "We ordered our digesters from the well known firm of Julius Pintsch & Co. of Berlin, Germany, and began our construction work in 1908. We produced the first kraft pulp in the United States in the summer of 1909". From this it appears that the Roanoke Mill was the first to be constructed for the sulphate kraft process and the first to make sulphate kraft pulp. Its output was on the market about three months before the Muskegon's. Roanoke has another great distinction. It was the pioneer kraft mill to demonstrate and utilize southern pine.

An interesting story is related about the building of that famous mill by the late Joseph H. Wallace, a distinguished American engineering chemist and a leading paper mill consultant and builder. He was called to England to design and build several large paper mills and while there heard about Carl P. Carlson's improved sulphate process. He went to Sweden in 1908 to investigate it. He had an entertaining journalistic writing style and has left us some notes relating to the establishment of the Roanoke mill that are worthy of being quoted. He wrote: "We invaded Norway and Sweden. Crossing the North Sea from Hull to Christiania (now called Oslo,) we encountered gales that rocked the little steamer so that nobody could eat. Our trip through Norway included visits to Moss where we saw our first sulphate mills in operation: Sarpsborg —the Kellner Partington Mills; Skotfos—the big Union Mills; Drammen, where Swenson and Ryberg were operating the first glassine and greaseproof products we had ever seen; then Katfos—Mjondalen, Gjethus, Lillestrom, then north over the mountains to Trondjhem, the most glorious trip one can have in the summertime.

Testing Plants for Sulphate

"While buying lumber for the mills we were build-



ing, in Europe, we came to the lumber mills at Savannah, Ga. and noted the waste burners all over the harbor. And there is where we fell! That observation and what followed have moved the wrapping paper business to the South. Barrels of this refuse went to New York. Miniature plants for testing it out for sulphate treatment were built—discarded—built again—again discarded and again built. Barrels of the material went to Sweden where Carl P. Carlson was the wizard of the sulphate mill. And in 1907, at Copenhagen, in Denmark, we met Carlson to discuss Southern pine possibilities.

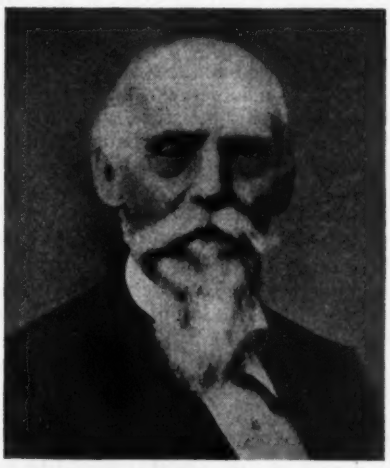
It was on that momentous occasion when Carlson became our associate in designing the first Southern sulphate mill in the United States—namely the mill of the Roanoke Rapids Paper Manufacturing Company at Roanoke Rapids, N. C. We bought digesters and diffusers from Julius Pintsch, A. B., Berlin, Germany, where we noticed that some undersea boats were also being made—this at the Pintsch shops at Farsstenwalde, near Berlin.

"Roanoke Rapids, N. C., was some place. We were engineers for a paper mill, ground wood pulp and sulphate fibre mill for Roanoke Rapids Paper Manufacturing Company—a power station and concrete dam for Roanoke Rapids Paper Company, and a board mill for Roanoke Rapids Fiber Board Company, all at one period.

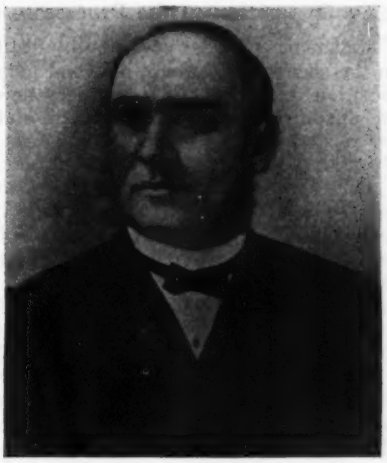
The second sulphate mill built in Canada was owned by the New Brunswick Pulp and Paper Company, Millerton, Miracichi, N. B. The machinery was made in England. Although the corporation was registered under the Canadian laws, the capital and management was British.

Yellow Pine Yielded Excellent Pulp

The Pensacola experiments in making pulp from Southern pine were duplicated in 1907 by Herbert S. Kimball, a well known chemical engineer. He stated that the Carlson process was well suited to the manufacture of pulp for a natural colored wrapping paper. He reported that he had investigated the possibilities of the waste woods of the United States for pulp making. He found that the yellow pine in the Southern States yielded an excellent pulp. The saw mill waste of yellow pine and spruce formed good sulphate pulp. Kimball referred to the bad odors given off from his experimental mill and said that means could be found for overcoming them. Users of the sulphate process in America have been fortunate comparatively in meeting opposition from the law on account of the evil smelling gases evolved by sulphate operations. European industrialists became involved in much litigation. The Swedish pulp men were constantly harassed in the early days by the sanitary authorities who objected to the odor of the fumes.



D. E. Mead



William A. Russell

The Swedish Chemical Pulp Manufacturers Association held a meeting in Stockholm in July, 1908 to oppose a restrictive law proposed in a Bill before the Diet. The following report, which explains their difficulties, was issued: "The objections against the sulphate industry are directed mostly against the odor caused by it. The odor has been called "insufferable", "disgusting", "rotten" and "sickening". Several experienced physicians who practiced among laborers from sulphate mills testified that they had not noticed more sickness among them than among other laborers. Some mill directors believed that work in such mills, to a certain degree, is a preventative of contagious diseases. It was impossible to show that a workman had become consumptive while working in a sulphate mill. Doctors advised consumptives to secure employment in the mills in order to regain health. Should anyone dislike the odor of a mill he should understand that the cause is a gas in a very minute quantity in the air—so small is it that it is perfectly harmless. The odor is similar to, and no worse than, cabbage water. Both odors are caused by the same chemical—methyl mercaptan or other organic sulphuric compounds."

Opposition to the Process

This statement reflects several interesting side lights on the chemical treatment of wood pulp. There was opposition to it as there is to every new invention. The opponents made many reckless statements. But allowance should be made for the fact that in the early years of the industry insufficient knowledge of the chemistry of the sulphate process was possessed by mill managers to cope with chemical problems. All sulphur gases have disagreeable odors which modern chemistry enables us to destroy or neutralize. While threatened legislation in Europe looked to destroy the sulphate industry, one of the greatest and most beneficial of its day, American mill men were not frequently restrained. This was due to the fact that they entered the field later than the Europeans and their chemists were able to utilize European discoveries in neutralizing objectionable chemical odors. The problem, however, has to be met in some mills.

Provided the cost of treatment can be met, there are numerous chemical and mechanical means for abstracting gases. Experiments with sulphate gases showed that, when they are cooked with disodium phosphate (Na_2PO_4), odors completely disappear. The charge is phosphate equivalent to 0.5 per cent of the weight of the wood. Similar results may be obtainable by running the liquor over a drying tower. Sometimes the steam and gases blown from a cook are condensed. This was done in the Muskegon Mill, Mich. Water sprays also dissolve and carry away the gases. Extensive American medical investigation confirmed those shown in Sweden—that odors from sulphate mills being injurious to public health is completely without any scientific foundation. In the localities of many American mills the health authorities report improvement in public health resulting from better living conditions that are promoted by the mills.

Experiment to Improve Chemical Processes

Many experiments were made to improve the chemical pulping processes. It was observed that in many pulp mills care is taken to produce pulps of the highest quality which are used for mixing with lower quality ground wood pulp. In 1923, the Forest Products Laboratory developed a semi-sulphite process which reduces cost and time of cooking. It consisted in regulating the temperature, concentration, time and ratio, of acid to chips so that the wood is only softened at the end of the reaction. The softened chips are blown from the digester, washed, and then fed to a mechanical disintegrator for reduction to pulp. The pulp obtained by this treatment can be utilized for many purposes the best pulps serve. It has been used in newsprint, wrapper and other papers.

Semi-Chemical Process

The advantages claimed for this semi-chemical process were:

1. It supplies the means for securing a high yield of pulp suited to newsprint and similar papers. Hemlock, spruce, hardwoods and mixtures can be used.

2. The yields can be varied easily from 40 to 50 per cent above those in older processes.

3. Cooking time is largely reduced because a complete cooking is unnecessary.

4. A maximum bursting strength of a point per pound per ream is secured for the pulp.

5. Screenings are eliminated.

6. There is an appreciable saving in costs.

The scheme employed in this process can be modified in many ways so as to be made adaptable to many needs. As long as the chemical methods of pulping are in use semi-chemical processes will be tried.

The soda, sulphite and sulphate processes for making wood pulp are among the outstanding inventions of modern times when the value of the great industries that are based on them is considered. They are not final, but trail blazers in a field that has enormous possibilities. Already chemists have demonstrated the promising qualities of other chemical processes. To suggest the scope of the untilled fields, the Mason steam defibering process can be considered.

W. H. Mason Invents News Process

W. H. Mason, a consulting engineer, was engaged in the early "twenties" in perfecting a process for extracting rosin and turpentine to recover those valuable by-products. Traveling in the Southern States he saw the great waste occuring in the saw mills in the lumber districts. He believed that the waste wood could be reclaimed and converted into pulp suited for making paper. He began his experiments in the spring of 1924 in the mill of the Wausau Southern Lumber Company, Laurel, Miss. He rejected chemical treatment of the wood on the ground of expense. Dealing with cheap material, the treatment had to be inexpensive. The problems to be solved was to separate the wood fibers and to save the lignins. He knew that wood softened when subjected to heat and moisture. Reflecting on this he thought that steam alone might offer a solution. How the solution was consummated is best told in Mr. Mason's own words:

"It occurred to me that wood being plastic when subjected to heat and moisture, and this plasticity probably being due to some change in the lignins under those conditions, it might be possible to soften the lignins and blow the fibers apart with the same steam that had been used to soften the wood.

"There were four phases of this problem to be considered.

1. Application of temperature and moisture in such manner as to soften the lignins more than the cellulose fiber.

2. Means of releasing the steam practically instantly.

3. Application of the temperature in such manner as not to mar or deteriorate the fibers.

4. The degree of pressure that would be necessary to disrupt the fibers at the time the pressure was

removed.

"The question of a working pressure came first. I knew it could not be done with 150 to 200 pounds, but just how much pressure was required I hadn't the faintest idea.

"At that time—in the spring of 1924—I had a turpentine extraction operation at the plant of the Wausau Southern Lumber Company at Laurel, Miss. My experimental plant was in an old shed adjoining the sawmill plant, and my first steam gun was a piece of old shafting some three inches in diameter and about fifteen inches long.

"In one end of the shafting we bored a hole, which was enlarged inside the cylindrical form to a dimension about twice as large as the size of the neck through which the boring was made. In one side of the shafting another small opening was drilled and a brass cup fitted on the inside of the cylinder and filled with oil, so as to make thermometer readings possible.

"The outside of the gun muzzle was tapered to a ground valve joint and the valve was held in place by a round-necked pin, supported in turn by a yoke surrounding the gun and bolted to the breech.

"The gun chamber was filled with chips and water, the valve placed in the breech opening, and the pin drawn back against the valve by tightening the bolts in the rear of the gun, holding the yoke firmly against the pin.

"Two gasoline torches were then directed against the side of the gun until the temperature on the inside rose to 480 degrees Fahrenheit, indicating a pressure of approximately 600 pounds. A four-foot long bar was placed with one end against the pin and a sharp blow with a hammer on the other end of the bar knocked the pin loose and allowed the valve to blow out.

"The first experiment with this makeshift fun was a complete success, so far as the defibering of the chips was concerned, although it took a long time to find the valve. The principle of steam explosion had been demonstrated at the first trial; for the rest it was a matter of continual experiment to establish the best working pressure and proper degree of temperature and time.

"For some weeks this experimental gun was used, during which time different kinds of wood were discharged from the muzzle, at varying pressures. We even tried to make white wood fiber, but there was always some darkening caused by the steam. Subsequently, two other experimental guns were constructed, in which pressures as high as 900 pounds were utilized. It was determined that the time element was just as important in exploding the chips as the steam pressure and temperature inside the gun.

"In present practice we subject the chips to a low pressure of 200 pounds for from 10 to 15 seconds, and then to a pressure of 1,000 pounds for from 3 to 5 seconds, before blowing them from the gun. This softens the lignins without damaging the fiber. We can apply the higher pressure direct for 6 seconds and obtain complete separation of the fiber, but the resultant pulp is not as good.

"Having worked out a method of defibering the sawmill wood waste, the next step was to find the best product to be made from the raw material. I took some of the fiber to the plant of the Bogalusa Paper Company at Bogalusa, La., where it was beaten up and made into a small sheet of paper by hand. The result did not look very good, so that attempt was dropped and another use sought for the material."

The experiments showed that by steam alone paper pulp can be made simply, inexpensively and quickly. This was an epoc-making discovery which will play a great role in the future. The experiments disclosed that in addition to paper, numerous products of commercial value can be made by the process. The inventor decided to utilize it for manufacturing presdwood, a hard durable board of high tensile strength. Another use of the exploded wood was for making insulating board. The Mason process does not call for high power costs, an expensive chemical plant, a loss of a high percentage of fibers, as in chemical processes, nor does it destroy, shorten or weaken the

CHAPTER IX

Remarkable Industrial Expansion

THERE was a remarkable impetus given to industrial expansion at the end of the nineteenth century. The movement was world wide and the outcome of the utilization of profits accumulated during the previous half-century. The development of transportation opened up new markets, inventions led to the establishment of new manufactures, bankers drew deposits from wide sources and a general feeling of prosperity caused them to search for new investments for their funds. Beginning in 1897 and continuing until about 1920, capital was applied to the leading industries in greater amounts than in any previous epoch. The paper industry benefitted by this movement and some of the largest corporations manufacturing paper in America originated in that great era of investment.

International Paper Co. Formed

The International Paper Company was the most outstanding of the period of consolidations. It was organized under the laws of New York, in 1898,

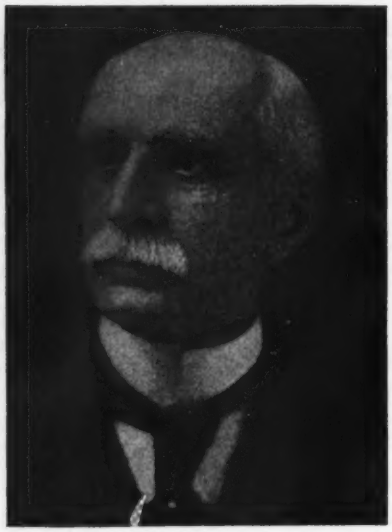
with a capital of $55,000,000. This was divided into $25,000,000 preferred and $20,000,000 common shares and $10,000,000 in bonds. It owned thirty-four of the largest mills in the Eastern States and many of the best water power sites. Woodlands were acquired in Maine, New Hampshire, Vermont, Massachusetts, New York and Ontario. This organization possessed the capacity to manufacture in quantity any type of paper product.

The American Writing Paper Corporation was organized under the laws of New Jersey, July, 1899. It was capitalized at $39,000,000 comprising $12,500,000 preferred and $9,500,000 common shares and $17,000,000 bonds. This company was reorganized under the laws of Delaware, January 28, 1937. When first organized, the company owned twenty-two mills with a daily capacity of 828,000 pounds of paper. The present capacity is 504,000 pounds.

The Great Northern Paper Company was organized in 1899 with a capital of $14,000,000. The West Virginia Pulp and Paper Company was reincorporated in 1899.

Among the large corporations that came into being after 1900 were: the St. Croix Paper Company, $2,500,000; the Finch, Pruyn & Co., $3,000,000; the consolidation of the Columbia River Paper Company and the Crown Paper Company as the Crown-Columbia Pulp and Paper Company, $1,000,000; the Champion Fibre Company to build a pulp mill in North Carolina, $1,000,000; the consolidation of the Bryant Paper Company, the Imperial Coating Mills and the Superior Paper Company into the Bryant Paper Company, of Kalamazoo, Mich.; the consolidation of the Tytus Paper Company, the Gardner Paper Company and the Middletown Paper Bag Company into the Tytus-Gardner Manufacturing Company, $1,000,000; the consolidation of the Nekoosa Paper Company, the John Edwards Manufacturing Company and the Port Edwards Fibre Company into the Nekoosa-Edwards Company, $3,000,000. The Bryant Paper Company's capital of $3,000,000 was increased to $6,500,000 in 1916.

The fortunes of the large companies followed the courses of the business cycles. Some of them were reconstructed and some failed to continue operations. There have been criticisms of large corporations, but there is no doubt that those operating in the paper industries have exerted powerful influences to the benefit of the industries. Only large aggregations of capital could have furnished America with the magnificent mills and paper resources it now possesses.



J. A. Kimberley

William H. Parsons

The Pacific North West Expands

The Pacific North West has long been celebrated for its forests and extensive lumbering operations. It was only natural for paper manufacturers to study the possibilities of utilizing the forests for paper making. Although mills were established at a much earlier date, a rapid expansion of the industry in this section began about 1925. The pioneer mills were built in Washington, Oregon and British Columbia. News and book papers were produced from hemlock and spruce logs.

The Pacific Coast mills produced 2,045 tons of all grades of pulp daily in 1923, and 7,638 tons in 1938. There was an increase in the daily production and consumption of pulpwood and pulp in the sixteen years of over 274 per cent. The daily production of all grades of paper and board was in 1923, 2056 tons and in 1939, 5,446 tons. This shows an increase of 165 per cent. These figures indicate the healthy trend of the West Coast industries.

Field for Continued Expansion

The field for the continued expansion of these industries is unlimited. The U. S. Forest Service estimates that the States of California, Oregon and Washington, contain one-half the saw-lumber and about 30 per cent of the pulpwood remaining uncut. As most of the North West Coast forests consist of trees suitable for pulping, the pulp wood reserves of the three western states are more than half as

large as the reserves in all the other states. They are among the greatest of the world's reserves.

The trees are tall and grow vigorously on the sides of the great mountain ranges, in the numerous valleys and along the rivers. They consist mainly of Douglas fir, hemlock, white fir, Silka spruce, yellow, white and sugar pines. The species are confined to growth on the western coast. The Silka spruce is one of our finest pulpwoods and it is less numerous than other western forest trees. It has often been proposed to use it extensively in reforestation. Climatic conditions are so favorable to reforesting work on the West Coast that little trouble would be experienced in laying out extensive and very valuable spruce lands. By proper reforestation, the quality and quantity of the forest products could be improved in an astonishing degree. This would be particularly so if a Luther Burbank could be found to plan and supervise the work.

Economic Conditions Good

The economic conditions of lumbering, transportation and marketing on the Pacific slope are good. Labor is slightly higher than on the East Coast and it is not always in good supply. In normal business times, unemployment is rare on the West Coast.

The markets for the Pacific Coast paper and pulp mills are in the Middle Western States, on the Pacific Coast of South America, in Australasia and Asia. These are markets that promise to expand largely in the future.

The paper and pulp industries are now well-established on the Pacific Coast both in the United States and Canada. Many of the mills are large and of the most up-to-date design. The growth of the industry is rapid and sound. There can be little doubt that it will go far in its development.

Recent developments show that the Pacific Coast pulps are highly suitable for converting into textile fibers. Several large mills prepare pulps, marketed as dissolving pulps for the textile and cellophane industries. The improvements being made in textile, plastic and other machines for working up wood pulp are so effective that each year demands increase for finer pulps. These improvements are certain to increase the production of pulp on the Pacific Coast. Some companies producing pulps for textile purposes are operating plants in Washington, Oregon and in the Southern States. They find few variations are required in the technique in converting pulp into rayon, artificial wool, cotton and other materials. Some chemists believe that the use of wood pulps for plastics, textile fibers and cellophane, and similar materials, will make a revolution in the pulp industries similar to that which occurred in the paper industries when wood pulp was substituted for old rags as a source of fibers.

CHAPTER X

The Great Development in the South

ONE of the most rapid and astonishing developments in the modern paper industry began in 1930 in the Southern States. In Colonial times, they were noted for their great forests and they have long been producers of lumber, turpentine and rosin. In 1810 there were about twenty-five paper mills operating in the Southern States. They were rag mills and are now chiefly interesting for indicating that paper making is not a new Southern industry.

Pulp and paper were made in a number of mills in the South from local pine after 1909, when the sulphate process was started to Roanoke Rapids. This movement was however greatly accelerated about 1930 by the promotional work of Dr. Charles Holmes Herty, a distinguished chemist who had long investigated processes for extracting turpentine and rosin from Southern pine. Dr. Herty, through his perseverance and technical skill in developing the use of Southern pine for the manufacture of all types of paper, was almost directly responsible for one of the greatest industrial and agricultural transformations in the history of the South. This was his pet project, but he already had placed the nation in his debt through his work in making German vat dyes available to American manufacturers during the World War, and in his research which led to the revolutionizing of the turpentine industry.

Southern Pine for Paper Manufacture

Dr. Herty had been convinced of the value of Southern pine in the manufacture of paper for a long time, but it was not until eight years ago that he got his opportunity to prove his premise. In 1932 he became director of the division of pulp and paper research of the Georgia State Department of Forestry and Geological Development, and this led to the establishment of a laboratory in Savannah in which he perfected his processes.

Southern slash, or yellow pine had been used for years for the manufacture of kraft, but the makers were not convinced that there was enough pine in the South to warrant the building of more mills.

Dr. Herty was convinced that not only was there enough pine, but that a steady supply could be maintained. He was thinking of the development in terms of new industries for the South and new opportunities for Southerners, and his research proved he could supply both.

He produced white paper and newsprint which

could be made at a considerable saving. He carried his experiments further and found he could make newsprint from black gum wood. His work with the pine trees produced a fatty by-product useful in the manufacture of soap, and his work with the gum trees disclosed a new source of rayon.

Contribution to Turpentine Industry

Dr. Herty's contribution to the turpentine industry was made early in the century, when he was a professor of chemistry at the University of North Carolina. He was interested in the Southern pine then as a source of naval stores. Turpentine operators at the time always hacked deep into a tree to make a recess or "box," which would gather about a quart of turpentine. The trees were being killed and Dr. Herty decided that something should be done.

His investigations showed that turpentine normally was not contained in the tree. The liquid was manufactured naturally when the inner bark was wounded. Thus he discovered not only that the deep slash was not necessary, but that the tree produced about 25 per cent more turpentine if only the inner bark was bruised. He developed the turpentine cup which was nailed to the tree. It is now in universal use.

Dr. Herty was born in Milledgville, Ga., on December 4, 1867. He studied at the University of Georgia, from which he was graduated in 1886, and four years later he received his Ph. D. from Johns Hopkins University. After studying abroad for some time he returned to Georgia to teach for two years, after which he served with the United States Bureau of Forestry for several years. Dr. Herty died in Savannah, Ga., on July 27, 1938.

The Southern Forests

The southern forests are composed of slash, loblolly, longleaf and jack pines. Many other trees are available. Dr. Charles Carpenter, formerly of the Herty Foundation Laboratory, reported that swamp black gum and cotton wood trees yield mechanical pulps of good color and up to 65 brightness. In carrying out viscose experiments, he demonstrated that swamp black gum, red gum and cottonwood, treated by the sulphite process, showed much promise. The hardwoods pulp and bleach more readily than pine. He predicts that in the future young pines will supply cellulose for the highest grades of viscose yarns and the pulping hardwoods will become sources for cellulose like staple fibers. The salvation of cotton growers promises to result from compensationary activities in securing southern pulp woods for the manufacture of rayon and similar products, for artificial boards, plastics and paper.

Dr. Charles Holmes Herty

Dr. Herty demonstrated that the Southern pines contain, in addition to cellulose and lignins, free fatty acids and glycerides of those acids. The resin acid contents of the sapwood are so low as to be negligible. It is in trees of older growth, about ten years, that high yields of resin acids and turpentine are secured. For this reason, trees under ten years of age are used for pulpwood. There are over 10,000 different kinds of paper manufactured today and over 90 per cent of them are made from wood pulp. The bulk of the paper is mass-produced newsprint. There is much pulp made for kraft, paper board, plastics, and threads for the textile industries and for other purposes. To meet the growing needs of industry for low cost pulps, improvements are constantly made in the technique of the pulp industry. Dr. Herty's researches on the distribution of resin, the fatty acids and their glycerides, showed, as was widely believed in former years, that the rosin contents of Southern trees were not a hindrance to its use for pulping, and the publicizing of his opinions, resulted in "putting Southern pulp on the map" and leading to the building of numerous mills of great daily capacity.

Desirable Advantages for Paper Making

The great areas opened in the South for paper making possess every desired advantage. There are numerous fine shipping ports on the Atlantic with vessels sailing to all the continents. There is good river and rail transportation. Labor supplies are good and manufacturing costs are low. Climatic conditions are favorable and distribution facilities are quite as satisfactory as those in the Northern States. In practically all particulars, the Southern industry operates under almost ideal conditions. This explains its rapid and sensational growth within a few years. Paper production by mass methods, utilizing the lowest cost processes, can be pursued in the South on an unlimited scale. Today, kraft and paper board are being produced at low costs and extensively marketed. Newsprint is claiming equal attention. In the opinion of experts the day is not far distant when the Southern States will rank among the world's greatest producers of newsprint paper. This is America's greatest prospect for a rapidly expanding paper industry.

The movement of the industry to the South calls for much capital expenditure. The investment in land, timber reserves, mechanical equipment and carrying charges, is large.

Controlling Expansion

In order to prevent concentration of production, the United States Forest Survey has announced that to control the expansion of the pulp industry in the South, the following policies have been adopted:

1. There should be no greater installation of mills than the local supplies can support without trespassing on the operations of other forest-using industries.
2. In so far as economic circumstances will permit, new mills should be distributed throughout the region and not concentrated in one area.
3. Each plant should be a permanent fixture and should utilize the timber in its territory on a sustained yield basis, with full regards for the needs of other wood-using industries.

There are no requirements with regard to reforestation. This should be insisted upon by the Government in the interest of the whole industry. Many large companies, fully recognizing the necessity for preserving pulp reserves for the future, are voluntarily replanting the worked over ground. This question is of far more importance to the national welfare than the three restrictions of the U. S. Forest Survey.

Great Storehouses of Fibrous Material

The South and the Pacific North West hold the greatest storehouse of fibrous material known. These extremely valuable resources are situated in perfect settings for profitable operations. They have their own definite markets and they are worthy of effective conservation. This is particularly necessary because it has been demonstrated that the demands for paper and pulp vary with the price. Newsprint, made from rags, in 1860, sold in New York City for twenty-two cents per pound. When the wood pulp industries developed they enabled newsprint to be sold profitably at two to three cents per pound. These great price variations were reflected in tremendous increases in the production of paper. Today, inventors are actively engaged in improving paper making machinery and in improving pulping so as to reduce costs and pave the way for still greater mass production. The opening up of the wood resources of the South has led to the use of cheaper types of wood and species of trees that are not demanded by lumber and other industries. These include hemlock, tamarack, jack pine and other trees.

It is well to remember that any substance rich in cellulose is suitable for making pulp.

Laboratory Experiments Made

Experiments were made in the laboratory in pulping southern woods by the soda, sulphate, sulphite and ground wood processes and the data secured attracted wide attention among American paper men. Mill-scale tests were made with excellent results, which left no doubt as to the value of southern woods for kraft and similar papers. All this work confirmed what Dr. Herty and other investigators had found and reported and influenced paper makers to realize that American forest resources suited to the fiber industries had been greatly enlarged in districts perfectly adapted to the establishment of pulp mills.

The Forest Products Laboratory in 1926-1927 worked out improved methods for cooking sulphate pulps from long leaf pines. Strong white pulps were secured by chlorination bleaching. Good newsprint papers were made by mixing pine sulphite pulps with pine ground wood and with black gum ground wood. Newsprint of good quality was made from black gum by semi-chemical methods. The semi-chemical, or mixtures of ground wood and chemical pulps, processes were found to be suited to pulping Southern hardwoods, chestnut and other trees. These pulps made good corrugated boards, butchers wrap and lighter colored paper grades.

The development of Southern paper mills has emphasized the physical and chemical differences of the Northern, North-Western and Southern pulpwoods. Their rates of growth, climatic differences, and fiber patterns, lead to different methods of technology in paper making. When they are thoroughly understood, it seems probable that physical and chemical processes can be discovered that will lead to marked

Courtesy of Rayonier, Inc.

MILL OF RAYONIER INC., FERNANDINA, FLA. WHERE FIRST BLEACHED SULPHITE WAS MADE FROM SOUTHERN PINE.

improvements in the qualities of the papers made from them. While much has been done in the scientific analyses of the Southern woods, a multitude of problems still await solution. Such research costs money and is laborious and time consuming, but it is a fundamental necessity in the production of profit-making industries. This is beginning to be recognized and many paper mills now have well equipped research laboratories.

The inducements held out for the establishment of paper mills in the Southern States included, besides the great resources of pulpwoods near navigable waters, were lower manufacturing costs. The pioneer mills found a saving of about 15 to 20 per cent in the construction of buildings. Wages were about 20 per cent lower than in Northern districts and there was a large saving in fuel and heating expenditures.

Great Mills Start in the South

The first tangible result of the impressive publicizing of the paper making resources of the South by Dr. Herty was seen in the formal opening October 1, 1936, of the first unit of the Union Bag and Paper Company's mill at Savannah, Ga. Two additional units were added in successive years giving the mill a capacity at present of thirteen digesters and producing 1,420,000 lbs. of sulphate pulp every twenty-four hours, and three 236 inch Fourdriniers and one 124 inch cylinder producing 1,250,000 lbs. of kraft paper and board.

The next outstanding development in the South was the opening of the Champion Paper and Fibre Company at Pasadena, Texas, in 1937. This was a bleached sulphate pulp mill. A paper unit has just been added which is equipped with one 214 inch Fourdrinier making coated paper.

The next mill in the South to claim wide attention was the plant of Rayonier, Inc., Fernandina, Fla., which started a pulp mill to make bleached sulphite from Southern pine which was an altogether new undertaking.

Following this the next unusual undertaking in the South was the opening of the Southland Paper Mills, Inc., at Lufkin, Texas, to make newsprint from Southern pine. This plant has its own ground wood mill, but purchases its bleached sulphate which it uses in place of sulphite from the Champion Paper and Fibre Company at Pasadena, Texas.

SOUTHLAND PAPER MILLS, INC., LUFKIN, TEX., WHERE FIRST NEWSPRINT WAS MADE FROM SOUTHERN PINE.

The list of the additional mills which have been opened in the South since the Union Bag and Paper Company opened its first unit at Savannah, shows the great importance of the Southern development in the short space of four years.

Hollingsworth & Whitney Company, Mobile, Ala., bleached sulphate fiber, 200,000 lbs.; unbleached sulphate fiber, 400,000 lbs. 24 hours. One 184 inch Fourdrinier and one 124 inch cylinder. Unbleached, semi-bleached and fully bleached kraft wrapping and specialties, 320,000 lbs. 24 hours.

Crossett Paper Mills, Crossett, Ark., bleached sulphate fiber, 180,000 lbs. 24 hours; unbleached sulphate fiber, 440,000 lbs. 24 hours. One 210 inch Fourdrinier and one 90 inch cylinder. Kraft bag, wrapping and butchers; bleached kraft bag, wrapping and butchers; bleached kraft, semi-bleached and natural board and butter carton and folding box boards. Fourdrinier mill, 400,000 lbs. 24 hours. Cylinder mill, 100,000 lbs. 24 hours.

Container Corporation of America, Fernandina, Fla., sulphate fiber, 300,000 lbs. 24 hours.

National Container Corporation, Jacksonville, Fla., sulphate fiber, 500,000 lbs. 24 hours. One 226 inch Fourdrinier. Kraft board, 400,000 lbs. 24 hours.

St. Joe Paper Company, Port St. Joe, Fla., sulphate fiber, 700,000 lbs. 24 hours. One 213 inch Fourdrinier. Fourdrinier kraft liner and .009 corrugating board, 700,000 lbs. 24 hours.

Brunswick Pulp and Paper Company, Brunswick, Ga., bleached sulphate fiber, 400,000 lbs. 24 hours.

Southern Kraft Corporation, Springhill, La., unbleached sulphate fiber, 1,450,000 lbs. 24 hours; bleached sulphate fiber, 330,000 lbs. 24 hours. One 204 inch and two 213 inch Fourdriniers. Fourdrinier board; bleached tag, manila, file folder, tablet, cup stock, milk bottle stock and envelopes. Bleached paper and board 300,000 lbs. 24 hours. Kraft board 1,400,000 lbs. 24 hours.

Ecusta Paper Corporation, Pisgah Forest, N. C. Four Fourdriniers. Cigarette paper.

North Carolina Pulp Company, Plymouth, N. C., bleached and unbleached sulphate fiber, 900,000 lbs. 24 hours. One 150 inch cylinder. Bleached, semi-bleached and unbleached board and paper specialties, 300,000 lbs. 24 hours.

West Virginia Pulp and Paper Company, Charleston, S. C., sulphate kraft fiber, 800,000 lbs. 24 hours. One 242 inch Fourdrinier. Container board, 800,000 lbs. 24 hours.

Southern Kraft Corporation, Georgetown, S. C., sulphate fiber, 1,400,000 lbs. 24 hours. Two 212 inch Fourdriniers. Fourdrinier liner board and Fourdrinier corrugating board, 1,300,000 lbs. 24 hours.

Chesapeake-Camp Corporation, Franklin, Va., sulphate fiber, 330,000 lbs. 24 hours. One 210 inch Fourdrinier. Kraft Fourdrinier liner, kraft corrugating, kraft wrapping, kraft bag paper and kraft specialties, 400,000 lbs. 24 hours.

Johns-Manville Corporation, Jarratt, Va., ground wood. Plain and decorative insulating board products, 300,000 sq. ft. 24 hours.

Florida Pulp and Paper Company, Canton, Fla., sulphate fiber, 160,000 lbs. 24 hours. One 158 inch Fourdrinier. Bleached sulphate specialties, 150,000 lbs. 24 hours. (Under Construction.)

St. Marys Kraft Corporation, St. Marys, Ga., sulphate fiber. (Under Construction.)

Flintkote Company, Meridian, Miss., wood fiber insulation board, 200,000 lbs. 24 hours. (Under Construction.)

Tennessee Valley Paper Mills, Inc., Savannah, Tenn., newsprint. (Under Construction.)

These were the pioneer companies. They were all large and the probability is that future plants will be large. This is due to local conditions. The mills generally own their own forests and are self-contained. This calls for a large investment in the first instance and then for a large working capital.

The first mills manufactured kraft papers and boards. Rayon and newsprint mills followed. The future holds out prospects of the newsprint industries moving southward and the center of the rayon and textile fiber manufactures centering there. It is certain that wood fibers and textiles made from them in the future will become great Southern industries.

CHAPTER XI

Scientific and Educational Cooperation

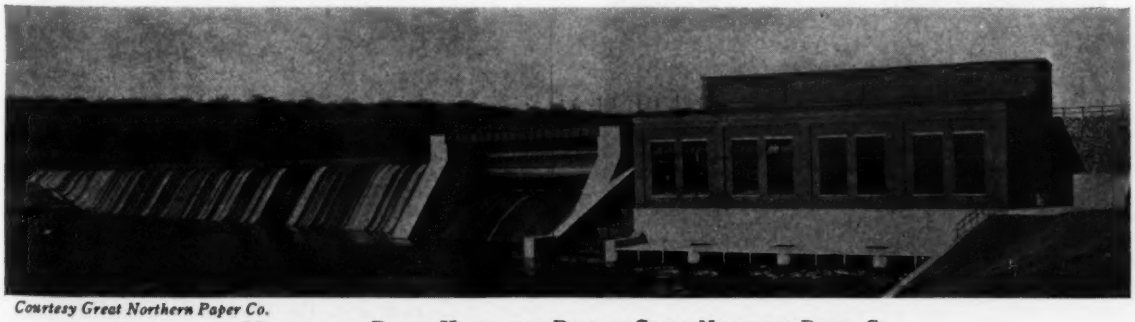
THE development of chemical and engineering aids have kept pace with other developments in paper manufacture. Water power was the first source used in American paper mills. Later on water and steam power plants were employed. That was the main reason for establishing paper mills on the banks of rivers and streams. The latest development was in electrical power. This followed the widespread utilization of electrical power in other industries. Electric power proved itself superior to all other prime forces for use in paper mills on account of the multiple operations it can be applied to. Like all other branches of engineering, electrical power development has undergone a marked evolution. Before the World War, the electrical power in paper plants was used in single motor drives directly connected by line shafts or transmitted through belt-driven pulleys. Variations in speed were secured by a combine of voltage and field control on the motor. The power came from a generator operating a belt driving a constant speed shaft. Cones, belts and clutches were used as they had previously been used in steam plants. When, during the first World War, larger paper machines called for greater speeds to meet increased demands for paper output, sectionalized drives were designed. The Crown-Willamette Paper Company, West Linn, Ore., installed a high-speed newsprint machine suitable for high or low speed operations. This was a nine-section outfit. This sectional drive supplied the power for a 164 inch Fourdrinier running at a speed of 1,000 feet per minute. It was a revolutionary plant and a successful one. Its success led to the wide adoption, in 1921 and later years, of sectionalized motor drives in many mills.

Electric motors are now used for driving most of the auxiliary mill machinery. Synchronous motors drive the wood-chippers, grinders, beaters, Jordans, pumps, conveyors and other equipment.

Many valuable electrically driven pieces of equipment have led to great economies in mills. In recent years photo-electric scanning heads have been adopted to detect spots and other defects in paper sheets passing the rolls. Great as the application of electrical machines and power are in paper plants, improvements are constantly being made and finality has not been reached.

The Recovery of Alkalies

In the recovery of alkalies from the spent liquor in sulphate and other processes, refinements in technique are being introduced with the view of increasing the amount of substance reclaimed and its quality so that general treatment costs might be reduced.



Courtesy Great Northern Paper Co.

MATTACOUNK POWER HOUSE AND DAM OF GREAT NORTHERN PAPER CO.

M. B. Mount, an expert in this work, reports that lime recovery, along with continuous causticizing and the washing of precipitated calcium carbonate sludges, came to the paper industry some thirty years ago as a result of pioneer work done by the manufacturers of alkaline products using the ammonia-soda process. Paper manufacturers have adapted the ideas to their own peculiar needs and requirements and the process of evolution is still at work. No part of it has been the subject of greater discussion and more divergence of opinion than that of lime recovery. In recent months this issue has been summarized as follows:

1. What should be the proper moisture content of precipitated calcium carbonate resulting from a causticizing operation when that sludge is fed into a recovery kiln?

2. Is it more economical to feed a sludge running 50-60 per cent moisture rather than one averaging 35-40 per cent moisture, measured on a dry basis?

3. Which method tends to produce the better grade of recovered lime?

4. Which method tends to simplify operation?

5. Is or is not the cost of the additional fuel required to evaporate the extra water offset by (a) obtaining a better product; (b) simplification of operation; (c) easing the work of the operators; or (d) the minimization of "ringing" in the kilns or dust losses through the stack?

To give point to these questions the observations of several qualified authorities are appended:

In answer to a question as to why water is not either eliminated from the calcium carbonate sludge charged into the kiln or added to the kiln feed, a mill executive stated: "It seems to be contrary to all accepted theory but my superintendent tells me that he gets better results by adding water after filtration; why, I don't know."

Another executive of long experience said, in effect: "You know as well as I do that a certain number of B.T.U.'s are required to evaporate a pound of water; why spend money for the drying and washing of the carbonate sludge and then spend more money for the evaporation of the added water? It doesn't sound reasonable to me."

The increasing application of science, chemistry and engineering to the paper making industries has called for the employment of many trained technicians. The practical man of the pioneer days has retired before the well-trained technical graduate from the universities, and engineering schools.

Courtesy Institute of Paper Chemistry

INSTITUTE OF PAPER CHEMISTRY

The Institute of Paper Chemistry

To supply chemical specialists to the American paper industry, the Institute of Paper Chemistry was organized by a group of Wisconsin pulp and paper mill men and the officials of Lawrence College, Appleton, Wis., in 929. Its first class was formed in February, 193(The purpose of this college was threefold:

1. The training of technical men, graduates of recognized colleges and universities, through a period of graduate study, to assume responsible positions in the industry.

2. The organization of a research library for the use of the Institute and the industry as a whole.

3. The establishment of a research center, where the latest scientific equipment and knowledge could be accumulated and made available to the industry and where researches could be carried on in both fundamental and applied problems.

The Institute is affiliated with Lawrence College, an institution chartered in 1847, which has a long tradition of sound scholastic standards and which, in recent years, has made an extraordinary advance in the educational world. This affiliation has given to the Institute the benefit of the administrative guidance of the College and of its established academic procedures and has made available, when desired, certain members of its staff of instruction.

Through this affiliation, also, it is possible for the students of The Institute of Paper Chemistry to receive the degrees of Master of Science and Doctor of Philosophy upon completion of the respective course of study, these degrees being granted by Lawrence College. The College is a member of the North Central Association of Colleges and Secondary Schools as a degree-granting institution and is on the original list of the Association of American Universities.

Director of the Institute

The President of Lawrence College, by virtue of his office, is the Director of the Institute. However, the active direction of the Institute is vested in the officers of a Board of Trustees, which is composed of leading executives in the pulp and paper industry. These Trustees represent the member mills as the holders of the property of the Institute and are the group who choose the officers and the staff of the Institute and who determine its general policies. The educational program of the Institute is determined by the Dean, with the cooperation of the other members of the staff of instruction.

In addition to the advantages accruing from the affiliation with Lawrence College, the location of the Institute at Appleton is strategic in that, within a seven mile radius of the city, there is nearly every type of pulp and paper manufacture, as well as many

of the more prominent lines of paper conversion. It is almost unique in the United States in this respect. It would be impossible to find any similar compact area with such a wide diversity of paper manufacture. In addition, much paper mill machinery and equipment is made in immediate proximity to Appleton, and the manufacturers of this type of material, both from this region and elsewhere, have been very liberal in supplying the Institute with equipment. Access to the illustrative material available in these manufacturing plants is thus assured to the students of the Institute.

There is a third benefit which results from the location. The Institute draws upon the experts now employed by the several manufacturing companies in this area. It is one of the fundamental features of the plans for The Institute of Paper Chemistry to have as members of its staff the highly trained men who have the practical experience which has come from years of service in manufacturing enterprises. These come into the Institute as special lecturers in their individual fields.

Other Paper Making Schools

Other paper making schools which are doing splendid work are, the University of Maine, Department of Chemical Engineering, Pulp and Paper Division in charge of Professor Paul Bray; and the New York State College of Forestry, Professor C. E. Libby in charge of pulp and paper manufacture. Paper making courses also are conducted at the present time at the University of Michigan, Ann Arbor, Mich.; the University of Washington, Seattle, Wash., and the Iowa State College, Ames, Iowa. Other opportunities for instruction in the manufacture of pulp and paper are afforded by the Institute of Industrial Arts School of Pulp and Paper Making at Gardenvale, Quebec; the Massachusetts Division of University Extension of the State of Massachusetts, James A. Moyer, Director, 200 Newbury street, Boston, Mass.; and the International Correspondence Schools, Scranton, Pa. Mill courses in the manufacture of pulp and paper are offered by the management of a large number of the larger mills of which good examples are the courses of the Champion Paper and Fibre Company at its Canton, N. C. mill and the Crown-Zellerbach Corporation at its Camas, Wash. mill. In this connection opportunity for self-instruction is offered by the five volumes of the "Manufacture of Pulp and Paper" prepared under the direction of the Joint Executive Committee on Vocational Education Representing the Pulp and Paper Industry of the United States and Canada. The first volume of this series was printed in 1921 and several volumes of the series have been reprinted several times showing the great value of the work.

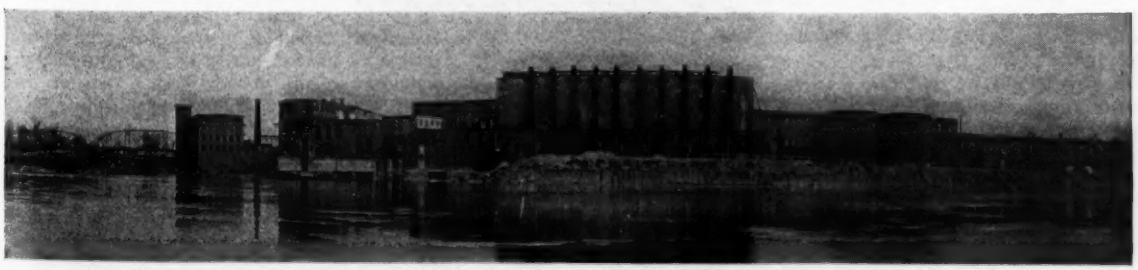
Forest Products Laboratory

The Forest Products Laboratory, United States Department of Agriculture, Forest Service, Madison, Wis., for quite a number of years has been doing research work of a high character which has conferred many benefits upon the industry. Carlisle P. Winslow is director and Dr. C. E. Curran is chief of the pulp and paper section. Important investigational work also has been conducted for some time by the National Bureau of Standards, Department of Commerce, of which L. J. Briggs is director and B. W. Scribner, chief of paper section.

Tariff Plays Important Roll

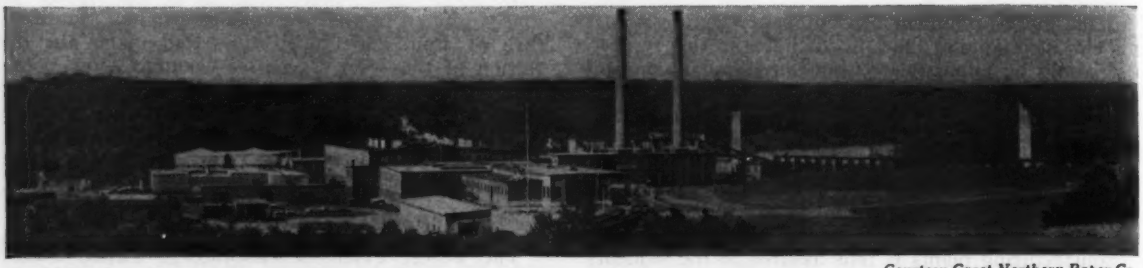
The tariff has played an important role in the development of the American paper industry. The first act, July 4, 1789, placed a duty of 7½ per cent on writing, news, wrapping, wall papers and pasteboard. The tariff of August 10, 1790, increased the duty to 10 per cent. The act of April 27, 1816, increased the duty on paper of every description to 30 per cent ad valorem. On May 22, 1824, the duty was increased on many papers to 10 cents per pound. The act of August 30, 1842, placed higher duties on several classes of paper. Writing paper was taxed 15 cents per pound.

A reduction of ten per cent was made in some classifications in the act of June 6, 1872. The act of March 3, 1883, kept the duty on newsprint at 10 per cent and 10 per cent on dried pulp. The act of October 1, 1890, placed a duty on ground wood of $2.50 per ton and $6 per ton on unbleached chemical wood pulp. The act of August 27, 1894, placed a duty of ten per cent on bleached and unbleached pulp. The act of July 24, 1897, made many changes. For the first time, newsprint was specifically mentioned. In previous tariffs it was taxed the same as book paper. The act of August 5, 1909, revised the duties on all imported papers. Newsprint valued at not over two cents per pound was taxed three-



Courtesy Great Northern Paper Co.

MADISON MILL OF GREAT NORTHERN PAPER CO.



Courtesy Great Northern Paper Co.

EAST MILLINOCKET MILL OF GREAT NORTHERN PAPER CO.

sixteenths of one cent per pound. Writing paper was taxed three cents per pound and 15 per cent ad valorem.

Newsprint Goes on Free List

The act of July 26, 1911, known as the Canadian Reciprocity Act, admitted pulp, newsprint and other papers, free. The October 3, 1913 act, admitted pulp and newsprint, valued not over 2½ cents, free, and made reductions on certain classes of paper with countries having reciprocal tariffs. This was the Underwood-Simmons Act.

When the tariffs were increased, as they generally were, paper prices increased and this attracted new capital investments and many new mills were built. Often this increased competition which adversely affected prices. Consequently, frequently changed tariffs resulted in corresponding changes in the production of paper. The Canadian Reciprocity tariff of July 26, 1911, made the greatest change in the industry. By admitting pulp and newsprint free, the Canadian industry was stimulated at our expense and Canada has been able to hold a large share of the business since.

Industry Has Bright Outlook

Surveying the industry on the 250th anniversary of its establishment, we have noticed changes of extreme interest. The early mills, making news, book, writing and boards in limited quantities, employed only two or three hands and less than $5,000 capital. In contrast we have magnificent mills costing many millions of dollars to construct and employing thousands of men. The day of the small mill is passing and the future will favor great mills with immense outputs. Great as the industry's success was in the past, its promises are brighter than ever. Its rapid evolution will continue to follow new and improved machinery, processes and products, while continually expanding markets will be served.

Mr. Master John Luke
Having served a legal Apprenticeship
to the Art of Paper Making is entitled to
participate in all its advantages.
Dated this 22 day of Feb 1826
Robt. Henderson Secretary.

CERTIFICATE OF PAPER MAKING GIVEN JOHN LUKE IN 1826 BY THE ENGLISH, IRISH AND SCOTCH PAPER MAKERS.

Equipment and Material Bought and Used By Pulp and Paper Mills

By W. G. MacNaughton, Engineer, News Print Service Bureau

ORIGINALLY, papermaking was a conversion process with rags, waste paper and later wood pulp and other substances as the basic raw materials. Many such mills exist at present located chiefly in populous centers and producing writing paper from rags and bleached wood pulp, book paper from deinked book papers and bleached wood pulp, and paperboard from mixed waste papers. Some of these have extended their operations to include subsequent processes such as coating, glazing and decorating the paper and, in the case of paperboard, the production of boxes and shipping containers which otherwise are carried out in separate fabricating plants.

Start Out As Conversion Mills

Many plants starting out as conversion papermills using wood pulp have later acquired pulp mills with supporting timber lands to supply their needs. Until about the turn of the century many plants made pulp only, groundwood, sulphite and sulphate pulps which was supplied to conversion mills.

Many of the conversion paper mills have attained large size and except for the wood pulp needed are self-contained in that they have their own power plants, repair shops and housing for their employes.

More Complete Integration of the Industry

It is, however, with the development of news print during the past half century and more recently of kraft wrapping paper and container board that more complete integration of the industry can be seen. In these plants the operations cover the range from the control of hundreds, and frequently, thousands of square miles of timber land, the production of pulpwood and its transportation, the manufacture of the pulps and the paper or board as well as townsite developments, and in the case of kraft the fabrication of the paper into bags or the paperboard into boxes and shipping containers.

Placed in Undeveloped Sections

Such integrated pulp and paper mills are usually placed in previously undeveloped sections and of necessity must be largely self-sufficient covering a wide range of activities and using equipment and supplies of all kinds.

Besides the plants and their equipment, there is necessary all the facilities for exploring, surveying and developing the timber lands, the production of the pulpwood and the means of transportation and storage of the wood and of the product.

Town Must Be Developed

In such a situation a town for the employes has to be developed with all the modern facilities of streets, water, sewage and lighting, housing, education, health and recreation as well as police and fire protection.

At the plant a repair and machine shop of greater than usual scope has to be maintained with a full complement of machine tools.

Large Users of Power and Steam

Since pulp and paper mills are very large users of power and steam, their hydroelectric and steam plants are among the largest of such industrial power plants and use all of the most modern appliances and control instruments.

In the pulp mills, depending on the process, many types of special equipment common to other industries are used. Such are large pressure vessels as boilers and digesters, screens, crushers and refiners, condensers and heat exchangers, as well as rotary kilns and vacuum evaporators.

Large Users of Important Materials

As many of the processes are productive of metal corrosion, pulp and paper mills are among the large users of aluminum, copper, bronze and the various stainless steels. They are also important users of all kinds of indicating, recording and controlling instruments.

It may be truly said that the pulp and paper industry, at the present time covers the entire range of operations from timber to finished product ready for use, including the needs of a populous community.

The outstanding feature of a fully integrated paper mill such as seen in many parts of this continent is the diversity and extent of the kinds of equipment, materials and supplies, and the facilities for repair and replacement of the vital elements.

The equipment and materials purchased and used by the paper and pulp mills is classified according to departments on the following pages.

- I.—Pulpwood
  1. Exploration
  2. Production
  3. Transportation
  4. Preparation and Storage
- II.—Wood Pulp
  1. Mechanical
  2. Soda
  3. Sulphate
  4. Sulphite
  5. Bleaching
  6. General equipment and supplies
- III.—Rags and Waste Paper
  1. Rags
  2. Waste paper
- IV.—Paper Manufacture
  1. Stock preparation
  2. Papermaking
  3. Paper finishing
- V.—Paper Conversion
  1. Coating
  2. Waxing
  3. Oiling
  4. Saturating
  5. Creping
  6. Pasting
  7. Ruling
  8. Printing
  9. Bag Making
  10. Box Making
  11. Tube Making
  12. Envelope Making
  13. Cup Making
  14. Cap Making
  15. Tablet Making
  16. General
- VI.—Power Plants
  1. Hydro-electric plant
  2. Steam power plant
  3. Supplies
- VII.—Engineering Department
  1. Drafting
  2. Surveying
  3. Construction
  4. Pattern shop
  5. Foundry
  6. Blacksmith shop
  7. Machine shop
  8. Carpenter shop
  9. Electrical repair
  10. General maintenance
- VIII—Laboratory Equipment
  1. Chemical Analysis
  2. Pulp testing
  3. Paper testing
  4. Coal testing
  5. Oil testing
  6. Cement testing
  7. Belt testing
  8. Meteorological records
  9. General
- IX.—Administration and General
- X.—Town
  1. Housing
  2. School
  3. Church
  4. Hospital
  5. Water and sewage
  6. Public safety
  7. Merchandising
  8. Hotel and boarding house
  9. Laundry
  10. Farm

PURCHASES FOR THESE DEPARTMENTS

I.—Pulpwood

1. EXPLORATION

Canoes, Boats and Camping supplies
Airplanes; Flying Boats
Aerial photography equipment
Radio equipment

2. PRODUCTION

Camp equipment and supplies; Cots and bedding; Heaters; Cooking ranges; Canned goods; Dried and preserved fruit; Condensed milk, etc.
Electric Lighting Equipment
Horses and Logging harness—Hay, oats, etc.
Horse trucks and logging sleds
Portable power saws; Portable barking machines; Cross cut saws; Wedges; Cant hooks; Peavies; Pike poles; Pickaroons; Chain; Axes; Bark Spuds; Tool handles
Donkey engines; Blocks and Cable
Power skidders and equipment

3. TRANSPORTATION

Side rod and Geared locomotives; Logging cars and Railroad equipment
Safety car stake equipment

Power trucks, Gasoline and Diesel tractors; Snow plows; Water tanks
Road machinery; Culverts
Gasoline and Diesel Power boats; Alligators; Tugs; Barges; Booms; Boom chains; Aerial tramways; Horse and Power loaders; Locomotive cranes; Wood grapples
Cableways; Flumes

4. Preparation and Storage

Saw carriages; Band saws; Slasher saws; Jump saws
Steam and power kickers and niggers; Jack ladders
Knife barkers and Barking attachments
Slab barkers
Drum barkers; wood washers
Log barkers
Pulpwood storage conveyors; Pulpwood stackers
Wood splitters operated by power and steam
Slab chippers
Knot borers
Wood "peckers"
Chippers; Rechippers; Crushers; Hogs
Chip driers; Chip screens
Bark presses; Conveyor scales

Supplies

Saws; Barker and Chipper knives
Cant hooks; Axes; Hookaroons

II.—Wood Pulp (General equipment in 6)

1. Mechanical Pulp

Pocket, Magazine and Caterpillar grinders
Dressing lathes and burrs
Grinder speed governors
Pressure regulating valves
Temperature regulators
Pressure pumps; Accumulators
Bull screens; sliver screens
Hydraulic presses
Wire mat weaving machines

Supplies

Pulpstones; Flanges; Shafts; Couplings
Flange removers; Flange bushings; Grinder piston packing

2. Soda Pulp

Soda pulp digesters; Pressure and Temperature Recorders
External heating equipment
Digester insulation; Pipe insulation
Blow tanks; Washing pans; Vacuum washing equipment
Black liquor filters
Multiple effect vacuum evaporators
Rotary furnaces
Dissolving tanks; Filter presses
Charcoal recovery apparatus
Causticizing tanks and apparatus
Continuous filters for washing lime sludge and brown pulp
Lime recovery apparatus
Chemical recovery systems
Waste heat boilers

Supplies

Soda ash; Chemical lime; Fire brick; Packing

3. Sulphate

Sulphate pulp digesters, welded steel and control instruments
External heating equipment
Digester insulation; Pipe insulation
Diffusers; Washing tanks; Washing apparatus
Multiple effect vacuum evaporators
Disk evaporators
Rotary furnaces
Smelting furnaces; Air compressors
Electrical precipitation equipment; Flue gas scrubbers
Dissolving tanks
Causticizing tanks
Vacuum filters for washing sludge and pulp
Continuous causticizing and lime recovery equipment
Rosin and turpentine recovery equipment

Supplies

Smelter furnace linings; Soapstone blocks
Salt cake; Chemical lime, Sulphur, Packing

4. Sulphite Pulp

Sulphite digesters and control instruments
Digester linings, Indirect heating equipment
Digester insulation; Pipe insulation
Blowoff valves; Relief valves, Steam separators
Digester relief coolers; Blowoff pipe
Acid pumps and valves
Stainless steel, bronze, monel metal and lead valves
Lead and bronze check valves
Blowpits; Drainer tile and matting
Waste sulphite liquor concentrating and drying equipment
Lead burning equipment
Sulphur burners and control instruments; Recording Pyrometers
Burner gas coolers; Refrigerating machines
Gas Washers

Milk of lime

Lime slackers
Milk of lime absorption systems
Gas exhausters

Limestone

Absorption towers and control equipment
Lead and bronze gas fans

Limestone quarrying equipment; Lime burning equipment
Acid storage tanks; Liquid level recorders
Recovery tanks and towers; Gas masks
Chemical stoneware; Tower packing

Supplies

Digester lining brick; Quartz; Litharge, Glycerine; Silicate of soda
Sheet lead; stainless steel; Lead, bronze and copper pipe
Bronze and hard lead strainers
Bronze and Monel metal shafting for acid pumps
Sulphur; Lime; Limestone

5. Bleaching

Electrolytic chlorine cell equipment
Caustic soda recovery equipment
Liquid chlorine absorption systems
Settling tanks
Pulp bleachers; Tanks and Agitators
Bleached pulp washing equipment

Supplies

Pulp; Salt; Liquid Chlorine; Lime; Caustic Soda

6. General Wood Pulp Equipment

Knotters; Diaphragm and centrifugal screens
Screenings refiners; Kollergangs
Rifflers
Thickeners; Deckers; Wet machines; Automatic skinners; Savealls; Sedimentation tanks
Pulp drying machines
Tanks, Agitators
Fans; Ventilating equipment
Centrifugal and Plunger stock pumps; Stock meters
Stock consistency regulators
Baling presses

Supplies

Screen plates; Screen diaphragms
Cylinder molds and Backing wire; Cylinder packing
Bronze and nickel alloy facing wire

III.—Rags and Waste Paper

1. Rags Preparation

Sorting tables; Conveyors; Ventilating equipment
Rag cutters; Dusters, Dust Collectors
Cylinder and Globe rotary boiler
Bleaching and washing engines
Drainers; Drainer tile

Supplies

Rags; Old rope; Baggings; Cotton linters; Manila; Hemp, etc.
Lime; Soda and ash; Bleach; Antichlor

2. Old Paper Conversion

Sorting tables; Conveyors; Ventilating equipment
Paper Shredders; Dusters, Dust Collectors
Vomiting boilers; Kiers; Cylinder and Globe rotary boilers; Tanks and Pumps
Special deinking and defibering equipment
Paper stock washing equipment
Continuous beaters and Beating attachments
Paper pulpers
Cooking and pulping engines
Magnetic separators

Supplies

Paper stock of all kinds
Soda ash; Caustic Soda; Sodium Silicate; Kerosene; Bentonite; Chlorine

IV.—Paper Manufacture

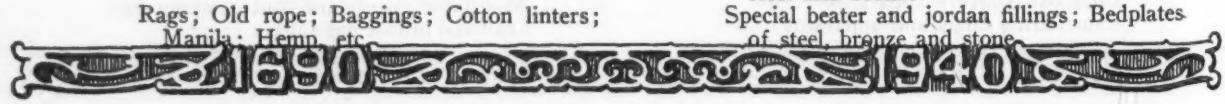
1. Stock Preparation

Equipment

Hand and electric trucks; Portable elevators; Monorail systems
Conveying and elevating equipment
Pulp shredders; Paper pulpers
Hollander and special beating engines; Lava stone beater rolls and bedplates; Beater attachments; Washing cylinders
Mixing tanks; Mixing and proportioning apparatus
Kollergangs; Refiners; Jordans; Tanks; Agitators; Agitator drives
Stock consistency regulators; Plunger and Centrifugal stock pumps
Water screens and filtering systems; Water pumps
Clay mixing apparatus; Stock chests; Gate valves
Size cookers; Emulsifying apparatus
Color testing and matching equipment; Daylight lamps
Savealls and sedimentation systems

Supplies

Wood pulp of all kinds; Rag pulp; Rope pulp; Cotton linters
Old paper; Shavings, etc.
Clay; Talc; Crown filler; Pearl hardening; Barytes; Blanc fixe, Satin white, Titanium oxide, etc.
Rosin; Soda ash; Size; Silicate of Soda; Glue; Starch
Sulphate of alumina
Aniline dyes and pigments
Beater and jordan bars of steel, manganese steel and bronze
Special beater and jordan fillings; Bedplates of steel, bronze and stone



Beater paddles
Stainless steel, copper, iron, steel, asbestos cement and wood pipe
Wood pipe fittings; Corporation cocks

2. PAPERMAKING

Equipment

Fourdrinier paper machines; Straight; Harper; Yankee
Cylinder paper machines; Single; Multi-cylinder
Single cylinder Yankee machines; Wet press machines
Combination and special paper machines
Non-condensing steam engines
Variable speed transmission equipment
Variable speed non-condensing steam engines
Non-condensing and bleeder steam turbines
Direct current electrical generators
Sectional motor drive systems
Direct current motor drive
Special drives: Marshall; Ferguson, Crandell
English system rope drive
American system rope drive
Paper machine attachments: Edwards; Tompkins-Hawley-Fuller
Sheahan paper carriers
Pope air system
Minton's vacuum driers
Slices and high stock inlet
Wire changing apparatus
Deckle frame supports
Wire guides; Felt guides; Drier felt guides; Recording tachometers; Special guard boards and doctors
Broke conveyor attachments
Felt washers and conditioners
Jacket stretchers
Oscillating suction boxes
Dandy rolls; special paper-marking equipment
Suction couch rolls; Suction presses
Special shower pipes; Press roll and Calender doctors
Steam circulation systems; Ddier drainage control systems
Vapor absorption system; Waste heat economizers
Dryloft equipment
Airdrying equipment
Hoods; Fans; Airheating equipment
Paper machine screens, diaphragm, oscillating and revolving
Special pulp cleaning apparatus
Chain blocks; Air and electric hoists; Travelling cranes; Reels; Winders and slitters
Collapsible windershafts; Electric irons
Oil and grease lubrication systems; Oil filters; Air compressors
Condensation pumps; Positive pressure blowers
Suction pumps; Fan pumps; Savealls; Sedimentation systems

Supplies

Fourdrinier wires; Cylinder facing wires
Woolen felts; Jackets; Drier felts of wool, canvas and asbestos; Deckle straps
Rubber covered rolls; Wood and granite press rolls
Calender rolls; Felt rolls; Table rolls
Suction box covers; Doctor blades
Wood cogs
Air, water and steam hose
Screen plates, Slitter knives
Belting and packing; Apron cloth; Splicing tissue
Oil; Grease, Waste, Sulphuric acid; Felt cleaning compounds; Foam and Pitch Killers
Wire brushes, Brooms, etc.

3. PAPER FINISHING

Rotary paper cutters; Layboys; Counters; Electric static neutralizers
Sheet trimmers
Rewinders
Paper tubes; Cores
Roll and package wrapping machines
Paper folding machines
Supercalenders; Embossing calenders
Platers; Friction calenders
Travelling cranes
Scales
Baling presses
Stencil cutting machines

Supplies

Glue; Dextrine; Silicate of Soda
Adhesives
Mill wrappers; Jute twine and tube rope
Sealing wrappers; Labels
Fiber shipping cases
Wood shipping cases and frames

V—Paper Conversion

1. Paper coating machinery
   Rubber blankets, brushes, coating clay, satin white, casein, glue, starch, borax, ammonia
2. Paper waxing machines
   Paraffin waxes
3. Oiling machines
4. Saturating machinery
5. Creping machines
6. Pasting machines
7. Ruling machines
8. Printing presses
9. Bag making machinery

10. Box making machinery
    Scorers; Corrugators; Pasters, Glue dissolvers; Gluing machines; Box covering machines
11. Paper tube and core making machinery
12. Envelope making machines
13. Paper cup making machinery
14. Bottle cap making machinery
15. Tablet making machinery
16. General equipment
    Wallboard driers
    Air conditioning equipment
    Air drying equipment
    Coating mixers
    Gumming machines
    Twisting machines
    Paper textile machines

VI—Power Plants

1. Hydroelectric Plant

Machinery and equipment

Penstocks; Gates, Racks
Waterwheels and turbines
Waterwheel governors
Electric generators and exciters; Motors
Switchboards and control equipment
Transformers; Lightning arrestors
Indicating, Integrating and Recording electrical instruments
Oil pressure recording instruments
Electric cranes and Hoists
Water Level recorders
Oil tanks and filters
Wood and steel poles and fittings; Power transmission wire; Messenger wire
High tension insulators

2. Steam Power Plant

Machinery and equipment

Steel, brick and concrete chimneys
Boilers of all designs; Superheaters; Economizers
Electric steam generators
Steam accumulators
Furnaces and automatic stokers; Hand stokers
Special furnace arches
Fans for forced and induced draft
Cinder eliminators
Air preheaters
Soot-blowing equipment; Tube cleaners
Draft control equipment
Feed water control equipment
Automatic relief valves; Whistles
Reducing valves; Blowoff valves
Coal bunkers; Coal elevators and conveyors
Coal storage equipment
Coal scales; Coal crushers
Coal pulverizing and burning equipment
Ash conveyors; Gratings; Ladders
Oil burning equipment
Fuel oil tanks
Tanks for lubricating oil
Water softeners; Feedwater heaters; Hot wells
Water meters; Steam flowmeters
Indicating and recording thermometers; Draft gages and steam gages
Boiler meters; Recording gas analyzers
Boilerfeed pumps; Steam traps and separators
Steam fire pumps
Boiler and steam pipe insulation
Steam turbines; Steam engines; Diesel engines; Gas engines; Electric generators and motors
Air washers
Engine stop and signals; Engine governors
Condensers; Air compressors
Switchboards
Circuit breakers and control switches

3. Supplies

Fire brick and fire clay; Special furnace shapes
Boiler tubes; Superheater and economizer tubes
Grate bars; Conveyor chain and buckets
Boiler compound
Fire hose; Steam, water and air hose
Steam and water packing and pump valves
Gage glasses; Gage glass protectors
Steam pipe, fittings and valves
Expansion joints
Steam traps and separators
Coal and fuel oil
Transformer oil
Lubricating oil; Steam cylinder oil
Cotton waste; Wiping rags; Packing
Waste washing machines

VII.—Engineering Department

1. Surveying

Transits; Levels; Rods; Chains; Steel tapes

2. Drafting

Drafting tables; Drafting instruments
Drawing and tracing paper; Tracing linen
Blueprinting machines; Blueprint paper
Cameras and printing equipment

3. Construction

General equipment and supplies for construction of dams, houses, offices, plant buildings and installation of machinery.

4. Pattern Shop

Pattern-making tools and supplies

5. FOUNDRY

Equipment, tools and supplies

6. BLACKSMITH SHOP

Forges: Anvils; Blacksmith's tools
Power punch and shears
Riveting hammers
Horseshoeing tools

7. MACHINE SHOP

Equipment

Portable hand and power operated and stationary power tools of all kinds
Traveling cranes; Jib cranes; Chain blocks
Drills; Lathes; Shapers in a few sizes; Electric drills
Boring mills; Milling machines; Key Seaters; Gear cutters
Roll grinders; Roll calipers
Knife grinders; Saw sharpening machines
Metal saws; Emery Wheels
Portable electric drills; Air hammers
Portable hydraulic forcing presses
Screw Jacks; Hydraulic jacks
Pipe cutting and Treading machines and hand tools
Valve reseating tools
Bolt cutters
Oxyacetylene and Electric cutting and welding equipment
Metal saws
Gas generators; Carbide
Paint spraying machines
Cement guns
Tachometers; Thickness gages; Calipers

8. CARPENTER SHOP

General carpenter shop equipment
Circular and band saws; Planers; Molders
Carpenter's hand tools
Wood plug machines; Wood core making machines

9. ELECTRICAL SHOP

Lineman's climbers and tools; Wire pullers
Conduit; insulators
Insulated wire
Receptacles; Brushes; Fuses
Switches; Lamps; Lamp guards; Flashlights.

10. MAINTENANCE AND SUPPLIES

Power Transmission

Shafting; Hangers and stands; Bearings; Bushings; Oil and grease cups
Pulleys of iron, Steel and Paper
Belt tighteners; Speed reducers
Gears and pinions; Miter and mortise gears
Rope sheaves; Sprockets
Shaft couplings; Flexible couplings; Friction couplings
Clutch couplings; Magnetic clutch couplings
Transmission rope
Transmission belting
Leather; Rubber; Balata; Camels hair; Canvas
Conveyor belting
Rubber; Canvas; Steel
Conveyor chains and attachments
Detachable and riveted
Wire cable and attachments
Belt hooks and lacing; Belt dressing; Rope dressing

Supplies

Spare machinery parts
Pipe couplings; Unions; Flanges; Elbows; Bends; Angles; Crosses
Packing
Rubber; Asbestos; Flax; Metallic
Gaskets
Fire doors; Wire glass; Steel sash
Ventilators
Expanded metal and Woven wire for guards
Paint for wood and metal
Tool steel
Steel, Iron, Stainless steel, Bronze and Monel metal in rods, bars and sheets
Cutting compound
Kerosene; Gasoline
Transformer oil
Lubricating oil

VIII.—Laboratory

Equipment

1. CHEMICAL ANALYSIS

Laboratory desks; Reagent cabinets; Hoods
Hot plates; Muffle furnaces
Balances and scales; Laboratory suction pumps
Water stills; Extraction apparatus
Chemical glassware; Equipment for volumetric analysis
Standard screens; Gage testers; Specific gravity instruments
Gas analysis equipment; Plastimeters; Stopwatches

2. PULP TESTING

Sampling tools and containers
Drying ovens
Laboratory ball mills; Laboratory beaters
Centrifuges; Freeness and slowness testers
Sheetmaking machines
Color comparison instruments; Stereopticons

3. PAPER TESTING

Basis weight scales; Micrometers; Microscopes
Bursting strength testers; Folding, Tearing and Tensile strength testers, &c.
Size testers; Glarimeters; Tint photometers; Fadeometers, &c.

4. Coal Testing

Laboratory coal crushers and pulverizers
Calorimeters; Standard thermometers

5. Oil Testing

Viscosimeters; Fire and flash testers

6. Cement Testing

Equipment

7. Belt Testing

Equipment

8. Meteorological Equipment

Maximum and minimum thermometers; Hygromters; Anemometers
Barometers; Precipitation measurement instruments

9. Supplies

C. P. Chemicals; Filter Paper; Glassware
General laboratory supplies

IX.—Administration and General

Equipment

Desks; Chairs; Filing cabinets; Safes; Safe cabinets
Dictaphones
Typewriters; Calculating machines; Bookkeeping machines; Check writers
Photostat machines
Duplicating machines

For the plants:

Sprinkler systems; Fire extinguishers; Fire hose, nozzles, etc.
Telephone systems; Electric clocks
Lightning rod equipment
Fencing; Safety signs
Time recorders; Watchman's clocks
Lockers, wash stands, shower baths

Supplies

Lithographed and printed letterheads and envelopes
Typewriting paper; Carbon paper; Typewriter supplies
Pens; Inks; Pencils
General office supplies

For the plants:

Waterproof clothing
Rubber boots
Picks, shovels, axes, brooms, etc.

X.—Town

1. Housing

Ready cut housebuilding material; Cement; Brick; Hollow tile
Lath; Plaster; Insulating materials; Prepared Roofing, Shingles; Wallboard; Roofing
Heating furnaces and stoves; Cooking ranges
Bathroom fixtures
House furnishings and furniture

2. School

Equipment and furniture, desks, &c.

3. Church

Furnishings and furniture

4. Hospital

Equipment for a small hospital
Hospital beds; Operating tables
Hospital and dispensary supplies

5. Water and Sewage

Standpipe; Pumping equipment; Water pipe. Hydrants
Water meters; Chlorination and filtration equipment
Sewer pipe; Catchbasins; Garbage incinerators

6. Public Safety

Police and fire protection equipment for village
Jail fixtures; Police uniforms
Fire engines; Fire hose and reels; Fire extinguishers; Gas masks.

7. Merchandising

Equipment, supplies and stocks for a general department store

8. Hotel and Boarding House

Complete equipment for sleeping rooms, bathrooms, dining room and kitchen
Hotel supplies

9. Laundry

Complete equipment and supplies for a steam laundry

10. Farm

Land clearing equipment
Farm machinery and tools
Barn and stable equipment for dairy farm
Veterinary supplies

Pulp and Paper Concerns in the U. S.

A LIST is presented herewith of the concerns in the United States, alphabetically according to states, making wood pulp and various kinds of paper or both. This list is printed here to fix in the record at this particular time the wide extent throughout the Union of the pulp and paper making industry 250 years after William Rittenhouse, the pioneer paper maker, established his mill in the United States.

As may be observed, some of the hundred of concerns represented in this list are located in every state in the Union with the exception of about a dozen. Because of the lack of space, the location, equipment and capacity of these mills are not given, but all of this information can be obtained from Lockwood's Directory of the Paper and Allied Trades.

Alabama

Gulf States Paper Corp.
Hollingsworth & Whitney Co.
Mobile Paper Mill Co.
National Gypsum Co.
Southern Kraft Corp.

Arkansas

Crossett Paper Mills
Southern Kraft Corp.

California

California-Oregon Paper Mills
Certain-Teed Products Corp.
Crown Zellerbach Corp.
El Rey Products Co.
Fernstrom Paper Mills, Inc.
Fibreboard Products, Inc.
Johns-Manville Products Corp.
Paraffine Companies, Inc.
Pioneer Div. The Flintkote Co.
United States Gypsum Co.
Volney Felt Mills, Inc.

Colorado

Central Fibre Products Co., Inc.

Connecticut

Burnside Co., Inc.
Case Bros., Inc.
Case Fiber Co.
Case & Risley Press Paper Co.
Colonial Board Co.
Connecticut Fibre Board Co., Inc.
Dexter, C. H., & Sons, Inc.
Foulds, William, & Co., Inc.
Inland Paper Board Co., Inc.
Lydall & Foulds Paper Co., Inc.
National Folding Box Co.
New Haven Pulp & Board Co.
Norton, C. H., Co.
Parker, Joseph, & Son Co.
Pond's Extract Co.
Raybestos-Manhattan, Inc.
Reclamation Co. of America
Red Mill Paper Board Co.
Robertson Paper Box Co., Inc.
Rogers Paper Mfg. Co.
St. Joe Paper Co.
Sanitary Paper Mills, Inc.
Setag Paper Mills, Inc.
Sterling Shoe Fibre Co.
Sterlite Fibre Products, Inc.
Stevens Paper Mills, Inc.
Union Box Board Co., Inc.
Wyoming Valley Paper Mill

Delaware

Container Corp. of America
Curtis Paper Co.
Marshall Bros., Inc.
National Vulcanized Fibre Co.
San-Nap-Pak Mfg. Co.

District of Columbia

District of Columbia Paper Mills, Inc.

Florida

Armstrong Cork Co.
Container Corp. of America
Florida Pulp & Paper Co.
Miami Mills, Inc.
National Container Corp.
Rayonier Inc.
St. Joe Paper Co.
Southern Kraft Corp.

Georgia

Atlantic Paper & Pulp Corp.
Brunswick Pulp & Paper Co.
National Paper Co.
Noble Mfg. Co.
St. Marys Kraft Corp.
Union Bag & Paper Corp.

Hawaiian Islands

Hawaiian Cane Products, Ltd.
Olaa Sugar Co.

Illinois

Alton Box Board Co.
American Asphalt Roof Corp.
Atlas Leather Co.
Ball Bros. Co.
Barrett Co.
Bemis Bro. Bag Co.
Burgess Cellulose Co.
Central Fire Products Co., Inc.
Certain-Teed Products Corp.
Consolidated Paper Co.
Container Corp. of America
Hopper Paper Co.
Johns-Manville Corp. of Delaware
Lehon Co.
Masonite Corp.
Morris Paper Mills
National Biscuit Co.
Prairie State Paper Mills, Inc.
Quaker Oats Co.
Rockton Felt & Paper Co.
Ruberoid Co., The
Southern Kraft Corp.
Standard Asbestos Mfg. Co.
Terre Haute Paper Co.
Waterway Board & Paper Co.

Indiana

Alton Box Board Co.
America Coating Mills, Inc.
Ball Bros. Co.
Beveridge Paper Co., The
Central Fibre Products Co., Inc.
Chillicothe Realty Co.
Container Corp. of America
Fort Wayne Corrugated Paper Co.
Hinde & Dauch Paper Co.
Fibre Form, Inc.
Funke, Ferdinand, Sons Co.
Hartford City Paper Co.
Kieffer Paper Mills
South Bend Paper Mill, Inc.
Southern Kraft Corp.
Terre Haute Paper Co., The
Volney Felt Mills, Inc.

Iowa

Albemarle-Chesapeake Co., Inc.
Hinde & Dauch Paper Co.
Maizewood Insulation Co.

Kansas

Central Fibre Products Co., Inc.
Lawrence Paper Co.

PULP AND PAPER CONCERNS IN U. S.—Continued

Louisiana

Brown Paper Mill Co., Inc., The
Calcasieu Sulphate Paper Co.
Celotex Corp.
Flintkote Co.
Gaylord Container Corp.
Southern Advance Bag & Paper Co., Inc.
Southern Kraft Corp.

Maine

Eastern Corp.
Fraser Paper, Ltd.
Great Northern Paper Co.
Hollingsworth & Whitney Co.
International Paper Co.
Kennebec Pulp & Paper Co.
Keyes Fibre Co.
Maine Seaboard Paper Co.
Northern Kraft Corp.
Old Town Co.
Oxford Paper Co.
Pejepscot Paper Co.
Penobscot Chemical Fibre Co.
Rogers Fibre Co., Inc.
St. Croix Paper Co.
Sherman & Co.
Supertex Corp.
United Paperboard Co.
United States Gypsum Co.
Warren, S. D., Co.
Waterfalls Paper Mills

Maryland

Acme Paper Board Co.
Bartgis Bros. Co.
Chesapeake Paperboard Co.
Congoleum-Nairn, Inc.
Elk Paper Mfg. Co.
Fager, Charles, & Son
Jessup & Moore Paper Co.
Schmidt & Ault Paper Co.
West Virginia Pulp & Paper Co.
Young, Ernest R., & Son

Massachusetts

Adams, A. L., Paper Co.
Advertisers Paper Mills
American Tissue Mills, Inc.
American Writing Paper Corp.
Bird & Son, Inc.
Brightwater Paper Co.
Brown, L. L., Paper Co.
Carew Mfg. Co.
Champion-International Co.
Chemical Paper Mfg. Co.
Collins Mfg. Co.
Commonwealth Supplies Co.
Crane & Co., Inc.
Crehore, C. F., & Son
Crocker, Burbank & Co., Ass'n.
Crocker-McElwain Co.
Deerfield Glassine Co.
Dighton Mfg. Co.
Du Pont de Nemours, E. I., & Co.
Erving Paper Mills
Esleeck Mfg. Co.
Falulah Paper Co.
Federated Mills, Inc.
Fitchburg Paper Co.
Franklin Paper Co.
Groton Leather Board Co.
Haverhill Boxboards, Div. of Robert Gair Co., Inc.
Hollingsworth & Vose Co.
Hurlbut Paper Co.
Jenkins, George O., Co.
Keith Paper Co.
Little, Arthur D., Inc.
Livingston Fibre Board Co., Inc.
Mead Corp.
Merrimac Paper Co., Inc.
Millers Falls Paper Co.
Mount Tom Sulphite Pulp Co.
Mountain Mill Corp.
Munroe Paper Corp.
Nashua River Paper Co.
Natick Box & Board Co.
New England Pulp & Paper Co.
Newton Paper Co.
Pairpoint Corp., The
Parsons Paper Co.
Rhode Island Card Board Co.
Rising Paper Co.
San-Nap-Pak Mfg. Co.
Smith Paper, Inc.
Southworth Co.
Spaulding Fibre Co., Inc.
Stevens Paper Mills, Inc.
Stony Brook Paper Co.
Strathmore Paper Co.
Taylor-Logan Co., Paper Makers
Tileston & Hollingsworth Co.
Valley Paper Co.
Westfield River Paper Co., Inc.
Weston, Byron, Co.
Whiting Paper Co.
Worthy Paper Co. Association

Michigan

Allied Paper Mills
American Box Board Co.
American Can Co.
Bryant Paper Co.
Central Paper Co., Inc.
Consolidated Paper Co.
Detroit Paper Products Corp.
Detroit Sulphite Pulp & Paper Co.
Dunn Sulphite Paper Co.
Eddy Paper Corp.
Escanaba Paper Co.
Filer Fibre Co.
Fletcher Paper Co.
Ford Motor Co.
French Paper Co.
Hawthorne Paper Co.
Hoskin Paper Co.
Kalamazoo Paper Co.
Kalamazoo Vegetable Parchment Co.
Lee Paper Co.
Mac Sim Bar Paper Co.
Manistique Pulp & Paper Co.
Michigan Carton Co.
Michigan Co. of Plainwell
Monroe Paper Co., Inc.
Monroe Paper Products Co.
Multicolor Packages, Inc.
Munising Paper Co., The
North American Pulp & Paper Corp.
Ontonagon Fibre Corp.
Otsego Falls Paper Mills, Inc.
Peninsular Paper Co.
Port Huron Sulphite & Paper Co.
Rex Paper Co.
River Raisin Paper Co.
Rochester Paper Co.
Simplex Paper Corp.
Southern Kraft Corp.
Stronach Paper Co.
Sutherland Paper Co.
Watervliet Paper Co.

Minnesota

Blandin Paper Co.
Hennepin Paper Co.
Minnesota & Ontario Paper Co.
Nelson, B. F., Mfg. Co.
Northwest Paper Co., The
Waldorf Paper Products Co.
Watab Paper Co.
Wood Conversion Co.

Mississippi

Flintkote Co.
Masonite Corp.
Southern Kraft Corp.
United States Gypsum Co.

Missouri

United States Gypsum Co.

PULP AND PAPER CONCERNS IN U. S.—Continued

New Hampshire

Amoskeag Paper Mills Co.
Ashland Paper Mill, Inc.
Ashuelot Paper Co.
Brown Co.
Claremont Paper Co., Inc.
Contoocook Valley Paper Co.
Coy Paper Co.
Cushman-Rankin Co.
Davis Paper Co.
Fisk Paper Co. Div. of Hinsdale Paper Mfg. Co.
Groveton Papers Co.
Hinsdale Paper Mfg. Co.
Milton Leather Board Co.
Monadnock Paper Mills
Morley Button Mfg. Co.
Norton, F. E., & Sons, Inc.
Parker-Young Co.
Penacook Fibre Co.
Robertson Co.
Robertson, G. E., & Co.
Seaboard Fibre Co.
Spaulding Fibre Co., Inc.
Wyoming Valley Paper Mill

New Jersey

Asbestos Limited, Inc.
Barrett Co.
Bogota Paper & Board Corp.
Boyle, John F., Co.
Bude-Mar Mills & Mfg. Co.
Clifton Paper Board Co.
Continental Paper Co.
Davey Co., The
Fandango Mills
Federal Paper Board Co., Inc.
Flintkote Co.
Hamersley Mfg. Co., Inc., The
Hinde & Dauch Paper Co.
Homasote Co.
Johns-Manville Corp.
Johnson & Johnson
Kenilworth Mfg. Co., Inc.
Kieckhefer Container Co.
Lowe Paper Co.
MacAndrews & Forbes Co.
Marcal Pulp & Paper Co., Inc.
McEwan Bros., Inc.
McEwan, R. B., & Son
Newark Boxboard Co.
Old Reliable Mills
Penquannock Valley Paper Co.
Riegel Paper Corp.
Ruberoid Co.
Schweitzer, Peter J., Inc.
Smith & Kanzler, Inc.
Sonoco Products Co.
Sterling Paper Converting Co.
United States Gypsum Co.
West Jersey Paper Mfg. Co.
Whippany Paperboard Co., Inc.

New York

A. P. W. Paper Co., Inc.
Adirondack Pulp & Paper Corp.
Albia Box & Paper Co.
Algonquin Paper Corp.
American Fibre Chair Seat Corp.
American Wood Board Co.
Ancram Paper Mills
Armstrong Cork Co.
Atlantic Asbestos Corp.
Berst-Forster-Dixfield Co., Inc.
Berwin Paper Corp.
Blandy Paper Co.
Bloomer Bros. Co.
Brownville Board Co.
Brownville Paper Co.
Burrows Paper Corp.
Carthage Paper Makers, Inc.
Certain-Teed Products Corp.
Central Hudson Paper Mills, Inc.
Columbia Box Board Mills, Inc.
Continental Paper Co.
Cottrell Paper Co., Inc.
Dexter Sulphite Pulp & Paper Co.
Diamond Mills Paper Co., Inc.
Eastman Kodak Co.
Edsall Paper Corp.
Electric City Paper Mills, Inc.
Endicott-Johnson Corp.
Fibre Conduit Co.
Fibre Forming Corp.
Finch, Pruyn & Co., Inc.
Flintkote Co.
Flower City Tissue Mills Co.
Fort Miller Pulp & Paper Co.
Fort Orange Paper Co.
Foster Paper Co., Inc.
Fox, W. H., & Sons, Inc.
Frost-White Paper Mills, Inc.
Gair Cartons, Div. Robert Gair Co., Inc.
Gair, Robert, Co., Inc.
Genesee Paper Mills, Inc.
Gotham Paper Mills, Inc.
Gould Paper Co.
Grand Bag & Paper Co., Inc.
Hoornbeek's, John C., Sons
Imperial Paper & Color Corp.
International Paper Co.
Iroquois Paper Co., Inc.
Island Paper Co., The
Johnston Pulp Corp.
Kieckhefer Container Co.
Kimberly-Clark Corp.
Knowlton Bros.
Latex Fibre Industries, Inc.
Lawless Bros. Paper Mills, Inc.
Lewis, J. P., Co., The
Little Falls Paper Co., Inc.
Malone Special Papers Inc.
Manning, John A., Paper Co., Inc.
Martin Pulp & Paper Co.
McIntyre Bros. Paper Co., Inc.
Midvale Paper Board Co., Inc.
Modern Tissues Corp.
Mohawk Paper Mills, Inc.
Mohawk Valley Paper Co., Inc.
Moyer & Pratt, Inc.
Muessman Paper Co.
Mutual Boxboard Co.
National Cellulose Corp.
National Gypsum Co.
National Mfg. Corp.
National Paper Products Co.
New York & Pennsylvania Co., Inc.
Newton Falls Paper Mill
North End Paper Co.
Onondaga Paper Co.
Oswego Falls Corp.
Oswego River Paper Mills
Phoenix Toilet & Paper Mfg. Co., Inc.
Racquette River Paper Co.
Read Paper Co., Inc.
Read, Robert E., Inc.
Riegel Paper Corp.
River Valley Tissue Mills, Inc.
Rogers, J. & J., Co.
Rondout Paper Mills, Inc.
Rushmore Paper Mills, Inc.
St. Regis Paper Co.
Schroon River Pulp & Paper Co.
Senoso Paper Co., Inc.
Sitroux Co., Inc.
Smeallie & Voorhees, Inc.
Snyder, W. W., Mfg. Co., Inc.
Spaulding Fibre Co., Inc.
Stevens & Thompson Paper Co.
Stillwater Tissue Mills, Inc.
Superfine Paper Mills, Inc.
Sweet Bros. Paper Mfg. Co., Inc.
Taggart Corp.
Thomas Paper Corp.
Tonawanda Boxboards, Div. of Robert Gair Co., Inc.
United Paperboard Co.
United States Gypsum Co.
Union Bag & Paper Corp.
Upson Co., The

PULP AND PAPER CONCERNS IN U. S.—Continued

Veldown Co., Inc.
Velvet Tissue Products Co., Inc.
Victoria Paper Mills Co.
Volney Felt Mills, Inc.
West Virginia Pulp & Paper Co.
Wood Flong Corp.

North Carolina

Carolina Fiber Co.
Champion Paper & Fibre Co.
Ecusta Paper Corp.
Halifax Paper Co., Inc.
Manchester Board & Paper Co., Inc.
North Carolina Pulp Co.
Riegel Paper Corp.
Sonoco Products Co.
Sylva Paperboard Co.

Ohio

Aetna Paper Co., The
Auglaize Box Board Co.
Albemarle-Chesapeake Co., Inc.
Bauer Bros. Co.
Beckett Paper Co., The
Carey, Philip, Mfg. Co.
Cellulo Co., Inc.
Champion Paper & Fibre Co.
Chase Bag Co.
Cheney Pulp & Paper Co.
Chillicothe Paper Co.
Chillicothe Realty Co.
Crystal Tissue Co.
Cincinnati Paper Board Co.
Container Corp. of America
Coshocton Straw Paper Co.
Dresden Paper Mill Co.
Fairfield Paper Co.
Fox Paper Co.
Franklin Board & Paper Co.
Gardner-Richardson Co.
Godman, H. C., Co.
Harding-Jones Paper Co.
Hinde & Dauch Paper Co.
Howard Paper Co., The
Jaite Co., The
Liberty Paper Board Co., Inc.
Logan-Long Co.
Massillon Paper Co.
Maxwell Paper Co.
Mead Corp.
Miamisburg Paper Co.
Munroe Falls Paper Co.
Muskingum Fiber Products Corp.
Ohio Box Board Co.
Ohio Paper Co.
Ohio Wax Paper Co.
Oxford Miami Paper Co.
Phillips, Thos., Co.
Queen City Paper Co.
Sall Mountain Co.
Sorg Paper Co.
Southern Kraft Corp.
Toronto Paper Mfg. Co.
United Paperboard Co.
United States Gypsum Co.
Walsh Paper Co., Inc.
Wardlow-Thomas Paper Co.
Weaver-Wall Co.
Wrenn Paper Co.

Oregon

Coos Bay Pulp Corp.
Crown Willamette Paper Co.
Fir-Tex Insulating Board Co.
Hawley Pulp & Paper Co.
Oregon Pulp & Paper Co.
St. Helens Pulp & Paper Co.
Spaulding Pulp & Paper Co.

Pennsylvania

Acme Paper Board Co.
Atlas Paper Mfg. Co.
Bare, D. M., Paper Co.
Bayless Pulp & Paper Corp.
Beach & Arthur Paper Co.
Bicking, S. Austin, Paper Mfg. Co.
Castanea Paper Co.
Certain-Teed Products Corp.
Container Corp. of America
Continental-Diamond Fibre Co.
Daring, C. B., Paper Mfg. Co.
Davey Co., The
Dill & Collins, Inc.
Downingtown Paper Co.
Durham Paper Board Co., Inc.
Eagle Paper Mills
Eaton-Dikeman Co.
Eden Paper Co.
Edgemont Paper Co., Inc.
General Paper Co., Inc.
Glassine Paper Co.
Glatfelter, P. H., Co.
Hammermill Paper Co.
Hamilton, W. C., & Sons, Inc.
Huntington Mills Paper Co.
Keasbey & Mattison Co.
Lysle, Wilson, Estate of
Mazer Paper Mills, Inc.
McDowell Paper Mills Div. of Glassine Paper Co.
Morgan Paper Co.
Mount Holly Paper Mill
New York & Pennsylvania Co., Inc.
Norristown Magnesia & Asbestos Co.
Paper Products Mfg. Co.
Paterson Parchment Paper Co.
Phil-Fibre Box Board Mills, Inc.
Pittston Paper Corp.
Ransom Paper Co.
Rieser Co., Inc.
Ruberoid Co.
Schmidt & Ault Paper Co.
Scott Paper Co.
Southern Kraft Corp.
Specialty Paperboard Mills, Inc.
Shryock Bros.
Tarentum Paper Mills
Taylor Fibre Co.
Union Mills Paper Mfg. Co.
United States Gypsum Co.
United States Paper Mills, Inc.
West Branch Paper Mill
West Virginia Pulp & Paper Co.
York Paper Mfg. Co., Inc.

Philippine Islands

Compania De Celulosa De Filipinas, Inc.

Rhode Island

Bird & Son, Inc.

South Carolina

Carolina Fiber Co.
Sonoco Products Co.
Southern Kraft Corp.
West Virginia Pulp & Paper Co.

Tennessee

Andrews, O. B., Co.
Buckeye Cotton Oil Co.
Harriman Co.
Mead Corp.
Southern Chemical Cotton Co.
Southern Extract Co.
Tennessee Paper Mills, Inc.
Tennessee Valley Paper Mills, Inc.

Texas

Champion Paper & Fibre Co.
Fleming & Sons, Inc.
Orange Pulp & Paper Mills, Inc.
Southland Paper Mills, Inc.

Vermont

Adams Paper Co., Inc.

PULP AND PAPER CONCERNS IN U. S. — Continued

Blake & Higgins Co., Inc., The
Fillmore & Slade, Inc.
Gilman Paper Co.
Kelley Paper Corp.
Missisquoi Corp.
Moore & Thompson Paper Co., Inc.
Putney Paper Co.
Ryegate Paper Co.

Virginia

Albemarle-Chesapeake Co., Inc.
Albemarle Paper Mfg. Co.
Bedford Pulp & Paper Co.
Cheasapeake-Camp Corp.
Chesapeake Corp.
Columbian Paper Co.
Eddy Paper Corp.
Hercules Powder Co.
Mummel-Ross Fibre Corp.
Johns-Manville Corp.
Manchester Board & Paper Co.
Mead Corp.
Standard Paper Mfg. Co.
West Virginia Pulp & Paper Co.

Washington

Berkheimer, J. E., Mfg. Co.
Columbia River Paper Mills
Crown Willamette Paper Co.
Everett Pulp & Paper Co.
Fibreboard Products, Inc.
Grays Harbor Pulp & Paper Co.
Inland Empire Paper Co.
Longview Fibre Co.
National Paper Products Co.
Pacific Coast Paper Mills
Pacific Straw Paper & Board Co.
Pulp Division Weyerhaeuser Timber Co.
Puget Sound Pulp & Timber Co.
Rayonier Inc.
St. Regis Kraft Co.
Soundview Pulp Co.
Tumwater Paper Mills Co.
Washington Pulp & Paper Corp.

West Virginia

Cherry River Paper Co.
George, S., Co.
Halltown Paper Board Co.
Hammond Bag & Paper Co.
Harvey Paper Mills Co.

Wisconsin

Badger Paper Mills, Inc.
Beloit Box Board Co.
Bergstrom Paper Co.
Combined Locks Paper Co.
Consolidated Water Power & Paper Co.
Cornell Wood Products Co.
Falls Pulp & Paper Co.
Flambeau Paper Co.
Forest Products Laboratory, United States Department of Agriculture, Forest Service
Fort Howard Paper Co.
Fox River Paper Corp.
Gilbert Paper Co.
Hoberg Paper Mills, Inc.
Hummel & Downing Co.
Institute of Paper Chemistry
Kimberly-Clark Corp.
Little Rapids Pulp Co.
Marathon Paper Mills Co.
Mosinee Paper Mills Co.
Neenah Paper Co.
Nekoosa Edwards Paper Co., Inc.
Nicolet Paper Corp.
Northern Paper Mills
Outagamie Mill
Peavey Paper Products Co.
Rhinelander Paper Co.
Riverside Paper Corp.
Southern Kraft Corp.
Sterling Pulp & Paper Co.
Stevens Point Pulp & Paper Co.
Strange, John, Paper Co.
Thilmany Pulp & Paper Co.
Tomahawk Kraft Paper Co.
Tomahawk Pulp Co.
U. S. Paper Mills Corp.
Ward Paper Co.
Wausau Paper Mills Co.
Whiting, Geo. A., Paper Co.
Whiting-Plover Paper Co.
Wisconsin River Paper & Pulp Co.
Wisconsin Tissue Mills
Wolf River Paper & Fiber Co.

Officers of the Paper Concerns in U. S.

A LIST is presented herewith of the officers of the companies who own pulp and paper mills in the United States at the present time. This impressive list of the names of hundreds of men now engaged in the manufacture of paper is in striking contrast to the few men who were associated with the industry in its infancy just two and one-half centuries ago. Lack of space prevents giving the names of the companies with which these men are connected, but this information can be fully obtained from Lockwood's Directory of the Paper and Allied Trades.

A

Abbott, De Verne, Vice-Pres.
Abraham, Herbert, Pres.
Adams, A. L., Pres.
Adams, C. J., Vice-Pres. and Treas.
Adams, J. A., Vice-Pres.
Adams, J. F., Pres.
Adie, John F., Pres. and Treas.
Aerts, R., Treas.
Afflerbach, M. W., Vice-Pres.
Ahrens, Edw. K., Sec.
Alexander, Ben, Pres., Chairman of Board
Alexander, J. E., Pres.
Alford, W. J., Jr., Pres. and Treas.
Allen, Horace E., Sec.
Allen, J. H., Pres.
Allen, John M., Pres.
Allen, Philip R., Chairman of the Board
Allen, Sarah, Sec.
Allison, O. M., Sec.-Treas.
Alston, C. P., Pres.
Altick, C. D., Pres.
Amdur, Dora, Treas.
Amdur, Jacob, Pres.
Amdur, Simon, Sec.
Ancona, F. W., Vice-Pres.
Anders, William H., Pres. and Treas.
Anderson, A. H., Sec.-Treas.

OFFICERS OF PAPER CONCERNS IN U. S. — Continued

Anderson, F. R., Vice-Pres.
Anderson, Ossian, Pres., Exec. Vice-Pres.
Andrews, C. K., Vice-Pres. and Treas.
Andrews, F. R., Treas.
Andrews, J. J., Sec.
Anthony, J. Harlan, Treas.
Arkell, Bartlett, Pres.
Armstrong, Dwight L., Vice-Pres.
Arndt, J. M., Vice-Pres.
Arnold, L. J., Treas.
Ash, Frank C., Vice-Pres. and Treas.
Asmuth, A. W., Pres.
Atwood, H. E., Vice-Pres.
Augsbury, B. S., Vice-Pres.
Augsbury, F. A., Pres.
Aull, J. A., Pres.
Aull, J. A., Jr., Vice-Pres. and Treas.
Avery, Sewell L., Chairman
Avery, T. M., Vice-Pres.

B

Babcock, B. L., Treas.
Babcock, Guy O., Vice-Pres.
Babson, Rogert W., Vice-Pres.
Bachert, K. W., Pres. and Treas.
Bachert, W. H., II, Sec.
Bachman, P. R., Vice-Pres.
Backes, C. B., Treas.
Bacon, Frank R., Pres.
Bagg, Aaron C., Pres.
Bagg, John L., Pres. and Treas.
Bailey, Sidney, Vice-Pres.
Baker, C. M., Pres.
Baker, M. H., Pres.
Baker, R. F., Pres. and Treas.
Baldwin, H. R., Vice-Pres.
Ball, F. Arthur, Vice-Pres.
Ball, Edmund F., Vice-Pres.
Ball, Edward, Pres.
Ball, F. C., Pres.
Ball, G. A., Vice-Pres.
Ball, William H., Vice-Pres.
Ballenberg, A. G., Treas.
Ballin, Chas., Treas.
Ballister, F. E., Pres. and Treas.
Bankus, Albert, Vice-Pres.
Barbare, N. J., Treas.
Barbash, H. L., Sec.
Barclay, Irene Long, Sec.
Bardeen, Maxwell D., Pres.
Barnard, C. E., Sec.-Treas.
Barthon, G. Howard, Pres.
Baruh, J. Y., Vice-Pres.
Bast, O. D., Sec.
Bast, Paul C., Vice-Pres., Sec.-Treas.
Bauer, Chas. L., Pres.
Baum, Geo., Vice-Pres. and Treas.
Baum, Isador, Pres.
Baumgartner, H. C., Treas.
Beal, J. E., Vice-Pres.
Bearce, E. F., Vice-Pres.
Beardslee, A. T., Vice-Pres.
Beasley, B., Sec.
Bechtel, J. A., Vice-Pres.
Becker, Folke, Pres. and Treas.
Beckett, Guy H., Vice-Pres.
Beckett, Mary M., Pres.
Beckett, William, Treas.
Beckley, James E., Vice-Pres.
Beckwith, W. H., Vice-Pres.
Begle, Ned G., Treas.
Behnke, H. J., Sec.
Behnke, J. H., Sec.
Behrend, Otto F., Treas.
Bell, Arthur F., Treas.
Bellack, R. F., Exec. Vice-Pres.
Bellinger, J. Erwin, Sec.
Bellows, John N., Treas.
Bemis, F. G., Pres.
Bennett, E. G., Treas.
Benson, M. G., Vice-Pres.
Bergstresser, H. F., Vice-Pres.
Bergstrom, J. N., Pres. and Treas.
Bergstrom, N. H., Vice-Pres. and Sec.
Berry, W., Sec.
Bersch, Wm., Vice-Pres.
Bertschy, Raymond P., Sec.
Beston, Arthur, Treas.
Beyer, R. B., Sec.
Bickelhaupt, G. B., Pres.
Biddle, E. O., Treas.
Bidwell, George, Sec.-Treas.
Bidwell, George L., Vice-Pres.
Birmingham, J. E., Sec.-Treas.
Bishop, Byron, Sec.
Bisbee, Spaulding, Treas.
Bitz, F. W., Sec.
Blackley, W. J., Vice-Pres.
Blackman, H. E., Treas.
Blackwell, W. H., Treas.
Blake, E. L., Sec.
Bland, T. Noel, Vice-Pres.
Blandin, C. K., Pres.
Blandy, D. E., Vice-Pres.
Blandy, Graham, 2nd, Pres.
Blandy, I. C., Pres. and Treas.
Bliss, Gorham, Pres. and Treas.
Bliss, Theodore, Sec.
Bloch, Louis, Chairman of Board
Blodgett, T. H., Chairman of Board
Blum, G. A., Sec.
Blume, A. L., Vice-Pres.
Board, C. E., Vice-Pres. and Treas.
Bonin, P. E., Treas.
Boswell, L. P., Sec.
Boulware, L. R., Vice-Pres.
Bowerfind, H. J., Chairman of Board
Bowers, George W., Pres.
Boyce, Charles W., Vice-Pres.
Boyd, Charles S., Pres. and Treas.
Boyd, R. E., Vice-Pres.
Boyle, James J., Sec.
Boyle, John F., Jr., Vice-Pres.
Boynton, W. P., Sec.
Brabson, J. M., Sec.
Bracewell, R. S., Sec.
Bracken, Alexander M., Treas.
Bracker, Mrs. Emma, Sec.
Bradford, Harry C., Vice-Pres. and Sec.
Braginton, C. A., Treas.
Brannan, John, Pres.
Bratton, U. S., Jr., Pres. and Treas.
Braun, Carl E., Vice-Pres.
Brener, M. F., Sec.-Treas.
Brennan, J. B., Pres.
Brewer, Frank, Vice-Pres.
Bright, J. W., Pres.
Bright, Lloyd S., Owner
Brisbois, N. M., Vice-Pres.
Bromley, W. F., Sec.
Bronson, Frederic E., Pres.
Brooks, H. L., Vice-Pres. and Sec.
Brossard, J. J., Vice-Pres.
Brown, Clinton W. Pres.
Brown, D. K., 1st Vice-Pres.
Brown, Mrs. E. W., Vice-Pres.
Brown, E. W., Jr., Vice-Pres.
Brown, F. E., Vice-Pres. and Treas.
Brown, Harold D., Sec.
Brown, H. J., Pres.
Brown, H. L., Pres.
Brown, H. T., Vice-Pres.
Brown, J. Bruce, Pres.
Brown, Joseph, Vice-Pres.
Brown, L. H., Pres.
Brown, Martin A., Treas.
Brown, O. B., Vice-Pres., Sec. and Treas.
Brown, Robert E., Pres. and Treas.
Browne, Paul, Sec.
Browning, Dwight L., Pres.
Bruff, James L., Sec.
Brust, W. T., Treas., Vice-Pres.
Bryan, C. M., Vice-Pres.
Buchanan, W. E., Sec.
Buehler, H., Jr., Vice-Pres. and Treas.

OFFICERS OF PAPER CONCERNS IN U. S. — Continued

Buehler, N., Sec.
Buell, J. A., Vice-Pres.
Bugge, S. B., Vice-Pres.
Bull, Karlh, Sec.
Bullen, Charles, Treas.
Burgstresser, A. K., Pres.
Burkhardt, F. T., Vice-Pres.
Burrell, Loomis, Vice-Pres.
Burrows, A. A., Pres.
Burrows, C. H., Pres.
Bush, S. L., Treas.
Butterworth, E. R., Vice-Pres.
Byerly, Albert W., Sec.
Byrne, H. J., Treas.

C

Cahill, T. A., Sec.-Treas.
Calder, Alexander, Pres.
Caldwell, P. L., Vice-Pres.
Caldwell, Robert, Vice-Pres.
Calkins, Wm. B., Vice-Pres.
Cameron, E. C. D., Sec.-Treas.
Camp, J. L., Jr., Pres.
Camp, J. M., Sec.-Treas.
Campbell, Charles, Pres.
Campbell, C. H., Vice-Pres.
Campbell, C. S., Treas.
Campbell, Murdoch, Sec.-Treas.
Campbell, Wm., Pres.
Campbell, William S., Vice-Pres.
Canfield, Albert S., Sec.
Cantine, Holley R., Pres.
Carey, Charles E., Exec. Vice-Pres.
Carey, D. P., Vice-Pres. and Treas.
Carey, V. F., Sec.
Carlisle, F. L., Chairman of Board
Carlson, Milbert, Sec.
Carmichael, G. T., Sec.-Treas.
Carpenter, A. B., Treas.
Carpenter, C. E., Vice-Pres.
Carpenter, C. H., Vice-Pres.
Carpenter, Mildred H., Vice-Pres.
Carpenter, N. H., Pres.
Carpenter, N. H., Jr., Treas.
Carroll, J. K., Sec.
Carter, Elliot A., Treas.
Carter, W. L., Vice-Pres.
Carter, Winthrop L., Pres.
Case, Mrs. C. C., Pres.
Case, Christopher M., Sec.-Treas.
Case, Lawrence W., Pres. and Treas.
Cashmore, Charles H., Pres. and Treas.
Caskey, Paul D., Sec.
Caspar, A. R., Vice-Pres.
Cass, Charles A., Sec.
Castle, H. A., Sec.-Treas.
Catlin, Edgar S., Vice-Pres.
Cayford, J. H., Vice-Pres.
Chahoon, I. H., Pres.
Chamberlin, S. Frank, Treas.
Chapin, R. F., Vice-Pres.
Chapleau, Gilbert J., Sec.
Chapman, F. B., Treas.
Chapman, Ralph W., Vice-Pres.
Chapelle, K., Sec.
Chase, E. W., Sec.
Cheney, Howard L., Owner
Cherry, H. T., Pres.
Chisholm, Hugh J., Pres.
Chiuminatto, P. M., Sec.-Treas.
Christiansen, E. J., Sec.
Christiansen, H. P., Vice-Pres.
Clapham, A. R., Pres.
Clapp, E. H., Treas.
Clark, Alvin S., Treas.
Clark, C. B., Pres.
Clark, E. W., Pres.
Clark, Robert C., Vice-Pres.
Clark, W. G., Chairman
Clark, William, Sec.
Clason, Hans, Sec.
Clifford, W. H., Treas.
Clough, George H., Treas.
Coale, B. W., Treas.
Cocker, F. W., Sec.-Treas.
Coe, Walter L., Treas.
Coffin, Arthur D., Chairman of Board
Coffin, Dexter D., Pres.
Coffin, J. D., Pres.
Cofrin, A. E., Pres. and Treas.
Cohen, Abe., Part Owner
Cohen, Joseph, Part Owner
Cohen, Samuel J., Part Owner
Cohen, William A., Vice-Pres.
Coke, John S., Sec.
Coker, C. W., Vice-Pres.
Coker, James L., Pres.
Coker, Richard G., Pres.
Cole, M. L., Sec.-Treas.
Coleman, H. F., Sec.-Treas.
Colgrove, Mrs. A. N., Vice-Pres.
Collins, Henry, Vice-Pres.
Collins, H. C., Pres.
Collins, W. A., Pres.
Combiner, F. P., Vice-Pres.
Comins, Raymond C., Treas.
Compton, B. H., Vice-Pres.
Compton, J. C., Pres.
Comstock, W. J., Treas.
Conklin, H. B., Pres.
Conklin, H. F., Vice-Pres.
Conrad, Chas. H., Sec.-Treas.
Conrad, C. W., Vice-Pres.
Conway, Joseph M., Pres.
Conway, Stanley, Sec.-Treas.
Cook, E. H., Pres.
Cook, George R. III, Vice-Pres.
Cooke, N., Sec.-Treas.
Cooley, Elmer B., Treas.
Coolidge, H. H., Vice-Pres.
Coolidge, J. B., Sec.
Coolin, W. S., Vice-Pres.
Cooper, B. H., Treas.
Copeland, Stuart B., Pres.
Corbett, Harry C., Pres.
Cormil, John, Vice-Pres.
Cornwall, E. C., Sec.-Treas.
Cosgrove, F. A., Treas.
Costello, Floyd C., Vice-Pres.
Costello, J. J., Treas.
Costigan, E. J., Vice-Pres.
Cottrell, A. Frank, Pres.
Cottrell, James T., Vice-Pres. and Sec.
Cowan, C. P., Vice-Pres.
Cowhill, Jos. H., Vice-Pres.
Cowles, D. H., Vice-Pres.
Cox, M. N., Sec.
Coy, F. E., Sec.-Treas.
Coy, J. H., Vice-Pres.
Crabbs, G. D., Chairman of Board
Crabbs, K. G., Vice-Pres. and Treas.
Crabbs, R. B., Pres.
Crabtree, David, Pres.
Crabtree, Edwin S., Vice-Pres.
Craig, B. J., Sec.
Crandall, Millie L., Sec.-Treas.
Crane, Frederick G., Vice-Pres.
Crane, Winthrop M., Jr., Pres.
Craven, Alice, Sec.
Crawford, E. A., Pres.
Crawford, W. S., Vice-Pres.
Crocker, Charles T., Pres. and Treas.
Crocker, Charles T., IIId, Vice-Pres.
Crocker, Douglas, Vice-Pres. and Sec.
Cronell, John E., Jr., Vice-Pres.
Cronin, Ambrose, Jr., Sec.
Crooker, E. L., Vice-Pres.
Crossett, E. C., Pres.
Crowther, C. R., Vice-Pres.
Croy, Leo E., Vice-Pres.
Crump, J. G., Treas.
Crump, R. S., Pres.
Cullen, R. J., Pres.
Cuneo, Newton, Treas.
Curtenius, A. E., Pres.
Curtenius, D. R., Pres.
Cushman, Henry O., Pres.
Cushman, James M., Vice-Pres.
Custer, M. D., Sec.-Treas.

OFFICERS OF PAPER CONCERNS IN U. S. — Continued

D

Dahlberg, B. G., Chairman, Pres.
Daniel, Charles E., Sec.-Treas.
Daniels, A. Millard, Pres. and Sec.
Daniels, H. S., Vice-Pres.
Daniels, Rupert B., Treas.
Darling, Kent C., Vice-Pres. and Treas.
Daum, Charles, Pres. and Treas.
Daum, Wm., Vice-Pres. and Sec.
Davenport, F. E., Vice-Pres.
Daverin, W. E., Sec.
Davey, Wm. O., Vice-Pres. and Treas.
Davis, F. E., Sec.-Treas.
Davis, H. W., Vice-Pres.
Davis, M. J., Pres.
Davis, N. F., Sec.
Davis, Robert T., Vice-Pres.
Davis, T. K., Sec.
Dawson, W. C., Treas.
Dawson, W. L., Pres.
Day, Margaret H., Treas.
Deacon, E. L., Sec.
DeCew, J. A., Pres. and Treas.
Dee, Thomas J., Vice-Pres.
Deffenbaugh, J. W., Vice-Pres.
De Guere, L. A., Vice-Pres., Pres.
Dejonge, Louis, Vice-Pres., Sec.-Treas.
De Mase, O., Vice-Pres.
Dempsey, E. J., Vice-Pres.
Dempsey, Edw. J., Sec.
Demsey, R. H., Vice-Pres.
Denison, A. C., Owner
Denman, D. S., Vice-Pres.
Dennison, C. C., Vice-Pres.
Denton, R. C., Vice-Pres.
Dern, John, Chairman of Board
De Roberts, R., Sec.
Desiderio, Anthony, Pres.
Desiderio, Dominick, Vice-Pres.
Desiderio, Thomas, Sec.-Treas.
Dettman, E. A., Sec.
Deupree, R. R., Pres.
Dice, Mrs. Mary Little, Vice-Pres.
Dickey, U. M., Pres.
Dickinson, F. M., Vice-Pres.
Dickinson, F. P., Sec.
Dickinson, K. S., Pres, Treas.
Dickinson, P. S., Vice-Pres.
Dickinson, Phil S., Sec.
Dillingham, W. F., Pres.
Dix, H. P., 2nd Vice-Pres.
Dixon, W. J., Vice-Pres, Sec.
Dixon, W. K., Sec.
Dixon, W. M., Vice-Pres.
Dodd, Allison, Chairman of Board
Dodd, E. Davey, Vice-Pres. and Sec.
Dodd, John A., Pres.
Dole, C. T., Pres.
Dole, W. T., Vice-Pres. and Sec.-Treas.
Donahoe, C. J., Sec.-Treas.
Donald, H. S., Sec.-Treas.
Donaldson, E. Victor, Pres.
Donohue, John W., Treas.
Dorsey, C. C., Vice-Pres.
Dow, Eugene, Pres.
Dowd, H. J., Vice-Pres.
Dunlap, C. K., Sec.
Dunn, George C., Sec.-Treas.
Dunn, Theo. W., Pres.
Dunnington, C. W., Sec.-Treas.
Dupont, E. P., Sec.-Treas.
Durand, G. F., Sec.
Dyke, George E., Pres.

E

Earhart, E. E., Vice-Pres.
Eckhardt, L. C., Sec.-Treas.
Edson, R. B., Sec.
Edwards, C. B., Sec.
Edwards, C. P., Sec.
Edwards, G. H., Pres.
Edwards, H. A., Treas.
Edwards, W. T., Vice-Pres.
Eisenberg, I., Pres.
Eisner, S. J., Sec.-Treas.
Eisner, Wm. J., Pres.
Ekberg, J. P., Vice-Pres.
Ellerson, H. W., Pres., Vice-Pres.
Elliott, George, Treas.
Ellis, Robert H., Vice-Pres.
Ellis, R. W., Sec.
Ellis, Zenith, Vice-Pres. and Treas.
Emerson, Albert L., Pres.
Emerson, Lowell, Pres.
Emerson, R. G., Sec.
Emery, E. Fred., Vice-Pres.
Enders, Fred., Vice-Pres.
Englander, Joseph, Pres. and Treas.
Esleeck, I. N., Pres.
Evans, Lyle S., Sec.
Everest, D. C., Sec.-Treas., Pres., Vice-Pres. and Treas.
Ewer, F. M., Treas.
Ewing, Clayton, Pres.
Ewing, R. D. W., Vice-Pres.
Eyster, J. A., Sec.

F

Fager, Charles, Pres.
Fager, Robert, Vice-Pres.
Fair, H. H., Chairman of Board
Fairbanks, Wm., C., Sec.
Fairburn, R. G., Vice-Pres.
Fairburn, William A., Vice-Pres.
Falconer, J., Treas.
Fannin, Geo. M., Vice-Pres. and Sec.
Farina, E. J., Vice-Pres.
Farley, Roy J., Vice-Pres.
Farwell, R. E., Treas.
Faulkner, P. H., Pres.
Faxon, H. P., Pres. and Treas.
Fearing, J. L., Vice-Pres.
Feinberg, A. W., Sec.
Feinberg, B. R., Pres.
Fell, L., Vice-Pres.
Fellows, L. F., Treas.
Feltenstein, M. E., Sec.-Treas.
Ferguson, Geo., K., Pres.
Ferguson, R. K., Pres.
Ferguson, S., Vice-Pres.
Ferguson, Sydney, Pres., Vice-Pres.
Fernald, T. W., Vice-Pres.
Fernstrom, Erik, Chairman of Board
Fernstrom, F. O., Pres.
Fieweger, R. J., Treas.
Fincken, Julius A., Vice-Pres.
Finder, Herman J., Pres.
Finder, Jerome M., Sec.
Finder, M. W., Treas.
Finger, S. B., Sec.-Treas.
Fink, Esther, Sec.-Treas.
Finlay, B. E., Pres.
Finlay, L. G., Vice-Pres.
Finley, C. E., Vice-Pres.
Fischer, F. C., Sec.
Fishburn, Victor E., Vice-Pres.
Fisher, H. D., Sec. and Treas.
Fisher, J. A., Pres. and Treas.
Fisher, Ralph M., Vice-Pres.
Fisher, W. A., Vice-Pres.
Fitts, R. L., Vice-Pres. and Treas.
Fitzgerald, Matthew J., Sec.-Treas.
Fitzgerald, William O., Treas.
Flaherty, Martin J., Pres.
Flanagan, John J., Vice-Pres. and Treas.
Fleming, A. S., Vice-Pres. and Treas.
Fleming, E. T., Jr., Vice-Pres.
Fleming, E. T., Sr., Pres.
Fleming, J. B., Sec.-Treas.
Fleming, John G., Vice-Pres.
Fletcher, J. S., Sec.
Flint, N. C., Vice-Pres.
Flockhart, Thomas A., Vice-Pres.
Flood, E. E., Sec.

OFFICERS OF PAPER CONCERNS IN U. S. — Continued

Flood, Jno. J., Vice-Pres.
Floyd, R. C., Vice-Pres.
Flynn, Della, Sec.-Treas.
Fonda, Fred C., Sec.
Forbes, E. A., Vice-Pres.
Ford, Edsel, Pres. and Treas.
Forkin, E. W., Sec.-Treas.
Forman, C. M., Sec. and Treas.
Forsyth, Wilfred L., Pres.
Fortune, Samuel J., Vice-Pres.
Foster, T. Stewart, Pres.
Foulds, William, Treas, Pres.
Foulds, William, Jr., Pres, Vice-Pres.
Fowler, George B., Vice-Pres. and Treas.
Fowler, Norman N., Pres.
Fowler, R. N., Vice-Pres. and Treas.
Fowler, William S., Sec.
Fox, John C., Pres.
Fox, O. A., Vice-Pres. and Treas.
Frampton, Frank D., Vice-Pres.
Francis, G. S., Sec.
Freas, A. G., Vice-Pres.
Freedman, Al H., Sec.-Treas.
Freedman, Peter, Sec.
Freeman, Eben W., Sec.
French, E. S., Sec.
French, F. G., Pres.
Friedlander, Frank V., Pres.
Friedlander, Victor, Sec.-Treas.
Friend, J. H., Vice-Pres.
Fritz, Charles B., Pres.
Fritz, Geo. T., Sec.-Treas.
Frobisher, R. S., Pres.
Frohman, Sidney, Pres.
Fry, Eugene W., Pres. and Treas.
Fry, H. M., Sec.-Treas.
Fry, Lloyd A., Pres.
Fry, S. R., Pres.
Fuller, C., Vice-Pres.
Funke, C. J., Vice-Pres.
Funke, Ferdinand A., Pres.
Funke, Joseph H., Sec.-Treas.

G

Gabrielson, Guy George, Pres.
Gaetske, M. J., Sec.
Gallagher, F. E., Vice-Pres.
Gallagher, L. P., Pres.
Gallagher, W. E., Vice-Pres. and Treas.
Galloway, Mrs. Gertrude Hagar, Vice-Pres.
Gamble, John T., Vice-Pres.
Gamble, W. S., Pres. and Treas.
Garber, L. F., Treas.
Gardner, Chas. H., Sec.-Treas.
Gardner, Chas. H., Treas.
Gardner, Colin, Vice-Pres.
Gardner, E. T., Pres.
Garfield, H. S., Treas.
Garroch, M. C., Sec.
Garstrang, Guy A., Sec.
Gartland, I. L., Vice-Pres.
Gartman, Edna W., Sec.
Gartman, George E., Pres. and Treas.
Garver, Ivan E., Pres.
Garver, Russell B., Vice-Pres.
Garvin, J. F., Treas.
Gatch, P. M., Vice-Pres.
Gates, B. W., Pres.
Gates, R., Treas.
Gay, E. R., Vice-Pres.
Gaylord, C. W., Pres.
Gayner, E. J., III, Vice-Pres.
Geddes, L. A., Sec.
Geddes, W. L., Pres.
Geer, William C., Pres.
Genuit, J. W., Vice-Pres.
George, T. H., Treas.
Gerpheide, G. H., Pres.
Gevaert, Dr. J., Pres.
Gianninni, Joseph, Vice-Pres.
Gibson, C. C., Treas.
Gibson, Wm. S., Pres.
Gideon, P. H., Treas.
Gieger, J. M., Sec.
Giessel, L. A., Treas.
Gilbert, A. C., Pres.
Gilbert, G. M., Vice-Pres.
Gilbert, J. B., Treas.
Gilbert, T. M., Sec.-Treas.
Gilman, Chas., Vice-Pres., Pres.
Gilman, Francis D., Sec.-Treas.
Gilman, Francis D., Jr., Pres.
Gilman, Isaac, Pres., Chairman of Board
Gilman, K., Pres.
Gilman, Mary, Treas.
Gilman, Michael, Pres.
Gilman, S., Vice-Pres.
Gilmore, Robert, Vice-Pres.
Ginsberg, Harry, Treas.
Gintzler, M., Sec.
Give, Henry de, Sec.
Glasgow, C. L., Vice-Pres. and Treas.
Glatfelter, P. H., Pres. and Treas.
Gleason, Daniel J., Pres.
Godhelp, J. C., Vice-Pres.
Goeltz, Lindsay, Sec.
Goessling, Val. J., Pres.
Goldsmith, Alan G., Treas., Vice-Pres.
Goldsmith, D. J., Sec.
Goldstein, M. F., Sec.
Goodell, E. G., Vice-Pres.
Goodspeed, H. L., Sec.
Goodspeed, W. S., 1st Vice-Pres. and Treas.
Goodwyn, W. L., Vice-Pres.
Goodyear, A. C., Chairman
Goodyear, C. W., 1st Vice-Pres.
Gordon, Charles A., 1st Vice-Pres.
Gorham, Thomas, Treas.
Gottwald, F. D., Vice-Pres.
Gould, Gordon H. P., Pres. and Treas.
Gouldman, W. S., Sec.
Graham, Edward M., Pres.
Grant, E. E., Pres.
Graves, A. O., Sec.-Treas.
Gray, Edward B., Treas.
Gray, E. E., Vice-Pres.
Gray, J. F., Pres.
Gray, Matthew J., Pres. and Treas.
Gray, W. P., Sec.-Treas.
Green, A. Irving, Pres.
Greene, D. H., Pres.
Greenway, Norman F., 1st Vice-Pres.
Greer, C. R., Sec.
Gregg, C. W., Treas.
Gridley, Oscar W., Pres.
Griffith, D. E., Sec.
Griffin, Courtlandt B., Pres.
Griffin, Roger C., Treas.
Griswold, Herbert H., Vice-Pres.
Groesbeck, A. J., Pres.
Guilbord, Alfred L., Treas.
Guild, Henry J., Pres.

H

Hair, Clarence, Sec.
Hakes, F. W., Pres.
Hall, M. B., Pres.
Hallagan, Stuart D., Treas.
Hallowell, J. J., Vice-Pres. and Sec.
Hallowell, R. M., Pres.
Hamburger, Eugene, Sec.
Hamersley, A. G., Vice-Pres. and Treas.
Hamilton, Walker, Vice-Pres.
Hann, Vincent R., Pres., Treas.
Hanrahan, J. A., Sec.
Hansen, A. B., Exec. Vice-Pres.
Hanson, H. H., Pres.
Harbrecht, J. W., Vice-Pres.
Harrigan, R. T., Pres.
Harris, W. B., Vice-Pres. and Treas.
Harrison, A. McL., Pres.

OFFICERS OF PAPER CONCERNS IN U. S. — Continued

Harrison, H. H., Vice-Pres.
Harrison, M., Vice-Pres.
Hartley, M. T., Vice-Pres.
Hartman, D. L., Vice-Pres.
Hartman, R. E., Pres.
Hartwell, Frank O., Exec. Vice-Pres.
Hartwell, R. L., Sec.
Harvey, Harold C., Pres. and Treas.
Harvey, I. J., Jr., Pres.
Haslanger, H. L., Vice-Pres.
Hauptli, H. A., Pres.
Havens, R. B., Treas.
Hawkes, A. W., Pres. and Chairman
Hawkins, Geo. W., Vice-Pres.
Hayes, J. V. J., Sec.
Haynes, E. A., Vice-Pres.
Hays, C. B., Vice-Pres.
Hayward, R. A., Pres.
Haywood, Francis, Treas.
Hazen, E. E., Pres.
Hecksher, August, Chairman
Hedstrom, Olaf, Sr., Pres.
Heinrich, John A., Sec.-Treas.
Heinritz, F. C., Sec.
Heit, N. E., Pres.
Henry, W. J., Vice-Pres.
Heppes, G. P., Vice-Pres.
Herb, J. J., Pres.
Herb, P. J., Vice-Pres.
Herman, Abraham, Sec.
Herz, Sol., Vice-Pres.
Hesse, C. G., Vice-Pres.
Heywood, F. C., Treas.
Hilfert, E. C., Sec.-Treas.
Hill, C. Dewey, Sec.
Hill, Irving, Pres.
Hillard, R. H., Vice-Pres.
Hilton, George, Sec.
Hilton, Wm., Vice Pres.
Hinds, A. K., Vice-Pres.
Hinkley, Philip E., Sec.
Hinkson, J. R., Pres. and Treas.
Hinman, J. H., Vice-Pres.
Hinman, Russell W., Sec., Treas.
Hirschey, U. C., Pres. and Treas.
Hoague, H. M., Pres.
Hobbs, V. C., Sec.
Hobson, Arthur L., Pres.
Hobson, John L., Vice-Pres. and Treas.
Hodgdon, Paul E., Exec. Vice-Pres.
Hodgdon, P. W., Pres. and Treas.
Hoeper, C. W., Vice-Pres.
Hoff, L. R., Vice-Pres.
Hoffman, H. H., Vice-Pres., Treas., Sec.
Hohle, K. O., Pres.
Holden, G. M., Vice-Pres.
Hollingsworth, Amor, Pres.
Hollingsworth, Phena, Vice-Pres. and Treas.
Hollingsworth, Valentine, Pres.
Hollis, Howard, Vice-Pres. and Sec.
Hollister, Dwight G. W., Pres.
Holmes, J. E., Pres. and Treas.
Hoopes, Maurice, Pres.
Hoornbeek, Arthur V., Partner
Hoornbeek, Louis A., Partner
Hopper, B. C., Pres.
Hormuth, G. Molitor, Vice-Pres.
Horr, R. G., Vice-Pres.
Hoskin, R. A., Vice-Pres.
Hoskin, R. W. S., Pres.
Housen, Morris, Vice-Pres.
Houston, Grafton, Vice-Pres. and Sec.
Houston, P. L., Vice-Pres.
Hovey, Rex W., Vice-Pres.
Howard, Harry C., Vice-Pres.
Howard, H. M., Pres.
Howard, L. S., Treas.
Howard, Maxwell, Pres.
Howard, Ward R., Vice-Pres. and Sec.
Howarth, C. W., Sec.
Howe, A. M., Vice-Pres.
Howell, E. W., Sec.
Howell, W. F., Sec.
Howell, Wilbur F., Sec.
Howes, H. C., Sec.-Treas.
Howland, Arthur V., Vice-Pres. and Sec.
Howland, Frank C., Treas.
Howland, Geo. S., Sec.
Hughes, V. A., Sec.
Hulbert, L., Treas.
Hummel, J. P., Chairman of Board
Hunt, J. F., Sec.
Hunt, L. M., Vice-Pres.
Hurlbut, W. N., Vice-Pres.
Hurwich, Samuel R., Vice-Pres.
Hutchison, J. K., Vice-Pres.
Huyssoon, Vice-Pres.
Hyatt, L. N., Vice-Pres.
Hyde, John E., Vice-Pres.

I

Ignatius, W. C., Sec.-Treas.
Ijams, F. B., Pres.
Ingram, Verner, Sec.
Ireland, W. W., Sec.
Irvine, H. H., Treas., Vice-Pres.
Irving, C. C., Vice-Pres.

J

Jack, J. M., Vice-Pres.
Jackson, H. C., Sec.
Jacobs, Clifton N., Vice-Pres.
Jaite, Robert G., Vice-Pres.
Jaite, Russell, Pres.
Jameson, Chas. F., Treas.
Jasperson, C. A., Sec.-Treas.
Jefferis, R. E., Sec.-Treas.
Jeffords, Frank W., Pres.
Jenkins, Geo. O., Jr., Vice-Pres.
Jenkins, H. Loring, Treas.
Jenkins, Robert A., Pres.
Jennings, E. H., Vice-Pres. and Sec.
Johnson, Chas. F., Jr., Vice-Pres.
Johnson, D. C.
Johnson, George F., Chairman
Johnson, Geo. W., Pres.
Johnson, H. C., Vice-Pres.
Johnson, Harry T., Vice-Pres.
Johnson, J. S., Vice-Pres.
Johnson, R. C., Vice-Pres.
Johnson, R. W., Chairman of Board
Johnson, T. O., Pres.
Johnston, E. B., Vice-Pres.
Johnston, Helen E., Part Owner
Johnston, John E., Part Owner
Johnston, J. K., Vice-Pres.
Johnston, M. S., Treas.
Johnston, R. C., Treas.
Johnston, Ruth M., Part Owner
Jones, A. S., Treas.
Jones, C. M., Sec.
Jones, H. H., Chairman
Jones, J., McHenry, Sec.
Jones, T. A. D., Vice-Pres.
Jones, T. E., Pres.
Jones, Walter D., Treas.
Jordan, A. H. B., Pres. and Treas.
Jubb, G. T., Sec.
Junod, Ray L., Vice-Pres.

K

Kaiser, C. Julian, Vice-Pres. and Sec.
Kanzler, George, Pres.
Kaufmann, Dr. B., Chairman
Kaufmann, Dr. Werner, 1st Vice-Pres.
Kazmierczak, Wojciech, Pres.
Keady, W. L., Vice-Pres.
Keesey, Horace, Sec.
Kehew, C. T., Sec.
Kehew, H. T., Treas.

OFFICERS OF PAPER CONCERNS IN U. S. — Continued

Keller, I. C., Vice-Pres.
Keller, Ralph E., Vice-Pres.
Kelley, H. F., Treas.
Kelley, M. B., Pres.
Kelley, William P., Pres. and Treas.
Kelly, John E., Pres.
Kemps, A., Vice-Pres.
Kendler, E. A., Sec.
Kendler, Ernest A., Sec.-Treas.
Kerr, Edward, Vice-Pres.
Kerr, Peter, Pres.
Ketchum, Henry G., Vice-Pres. and Sec.
Ketchum, Mrs. Rosalie S., Pres.
Kettra, W. H., Treas.
Key, J. Frank, Sec.
Kieckhefer, H. M., Sec.-Treas.
Kieckhefer, J. W., Pres. and Vice-Pres.
Kieckhefer, W. F., Sec.-Treas.
Kiefer, E. W., Pres.
Kiefer, F., Vice-Pres.
Kieffer, J. E., Treas.
Killmer, Ogden, Sec.
Kimberly, J. C., Pres.
Kimburly, Geo. M., Vice-Pres.
Kindleberger, J., Chairman
King John F., Sec.-Treas.
King, H. R., Pres.
Kingsley, A. D., Pres.
Kipnis, Samuel, Pres.
Kirsch, Alfred J., Vice-Pres. and Sec.
Kirschbraun, Lester, Vice-Pres.
Klefeker, Chas. B., Vice-Pres.
Kleinstuck, C. H., Vice-Pres.
Kling, Walter L., Vice-Pres. and Sec.
Klugman, B., Sec.-Treas.
Knapp, Harold, Vice-Pres.
Knauer, R. F., Sec.-Treas.
Knode, O. M., Pres.
Knode, S. C., Vice-Pres.
Knott, Harold R., Vice-Pres.
Knowles, John A., Vice-Pres.
Knowlton, G. S., Chairman of Board
Knowlton, T. E., Pres.
Koester, F. P., Pres. and Treas.
Koons, J. A., Owner
Koons, L. R., Owner
Koplin, L. C., Vice-Pres.
Koster, H. F., Sec.-Treas.
Kretchman, L. F., Sec.
Kreutzer, A. L., Pres. and Treas.
Krohn, Joseph J., Sec.-Treas.
Kuhns, H. B., Vice-Pres.
Kupfer, Louis, Pres.
Kurth, Ernest L., Pres.

L

Lake, J. W., Vice-Pres.
Landeck, Walter V., Vice-Pres.
Landis, R. K., Sec.
Langtry, W. W., Vice-Pres.
Lannan, E. P., Sec.-Treas.
Larkin, E. H., Vice-Pres.
Larsen, V. H., Vice-Pres.
LaRue, W. S., Vice-Pres.
Lavner, H. J., Vice-Pres.
Lawless, C. H., Sec.
Lawless, David F., Pres., Treas.
Lawless, F. J., Treas.
Lawless, M. J., Treas., Pres., Vice-Pres.
Lawless, M. J., Vice-Pres.
Lawless, T. E., Pres.
Lawrence, Carl A., Vice-Pres.
Lawrence, M. Anne, Sec.
Lawrence, W. J., Bryant Paper Co., Pres.
Leadbetter, F. W., Pres.
Leadbetter, Pittock, Sec.
Leathers, Don B., Treas.
Lebold, F. M., Pres.
Lebold, S. N., Sec.
Ledeboer, John W., Vice-Pres.
Lehon, Tom, Vice-Pres.
Lennox, Robert W. Treas.
Leonard, A. G., Pres.
Leonard, A. G., Jr., Sec.
Leonard, E. A., Treas.
Leonhard, E. R., Vice Pres.
Leonhard, W. C., 1st Vice-Pres.
Leroy, J. A., Vice-Pres.
Leslie, D. S., 1st Vice-Pres.
Levine, Arthur, Vice-Pres.
Levis, Charles M., Pres.
Levis, Joseph J., Vice-Pres.
Levisohn, Samuel, Vice-Pres. and Treas.
Lewis, H. S., Pres.
Lewis, Wm. G., Jr., Copartner.
Liebman, Charles R., Treas.
Light, C. K., Pres.
Light, S. R., Vice-Pres.
Liginger, J. W. D., Sec.-Treas.
Limbeck, George, Vice-Pres.
Lingenfelter, J. H., Sec.-Treas.
Lipa, L. M., Sec.-Treas.
Litz, J. L., Sec.-Treas.
Livingston, Fred A., Pres.
Livingston, Warner C., Sec.
Lockett, Charles L., Jr., Vice-Pres.
Lockwood, Albert, Treas.
Loewin, Arthur, Sec.
Logan, G. Stanley, Treas.
Logan, James N., Vice-Pres.
Logan, John, Pres.
Logan, John, Jr., 2nd Vice-Pres.
Long, Godfrey B., 1st Vice-Pres.
Long, L. J., Exec. Vice-Pres.
Lopin, Sam, Vice-Pres. and Sec.
Loring, Albert S., Vice-Pres.
Lothrop, Francis B., Pres.
Love, E. M., Pres.
Lowe, Donald V., Vice-Pres.
Lowe, Erving F., Pres.
Lowe, Joseph A., Sec.-Treas.
Lowe, Malcolm B., Sec.-Treas.
Lowe, M. V., Pres.
Lowe, Walter A., Vice-Pres.
Lowe, W. H., Pres.
Lowenstein, A. B., Vice-Pres.
Luke, Adam K., Vice-Pres. and Treas.
Luke, David L., Jr., Vice-Pres.
Luke, Thomas, Pres.
Lupton, E. H., Pres. and Treas.
Lyall, L. B., Sec.-Treas.
Lydall, E. A., Sec.-Treas.
Lynch, M. T., Vice-Pres.
Lynch, Walton D., Vice-Pres.
Lysle, M. R., Sec.-Treas.

M

McAdoo, Henry W., Vice-Pres.
McBride, K. R., Pres.
McCabe, T. B., Pres.
McClellan, W. S., Vice-Pres.
McCloskey, L. T., Vice-Pres.
McColloch, Frank C., Sec.
McConnell, A. R., Vice-Pres.
McCormick, J. C., Sec.-Treas.
McCulfor, Roy V., Treas.
McCoullough, Mat, Treas.
McCush, Wm., Treas.
McDaniel, H. C., Vice-Pres. and Sec.
McDevitt, Leo R., Vice-Pres. and Sec.
McDonald, Miss H., Treas.
McDonald, James, Vice-Pres.
McDonald, M. C., Vice-Pres.
McDonald, R. A., Exec. Vice-Pres.
McDowell, J. Norman, Treas.
McElwain, R. F., Vice-Pres.
McEwan, Arthur, Pres.
McEwan, Fred, Pres. and Treas.
McEwan, N., Grace, Sec.
McEwan, M. B., Sec.

OFFICERS OF PAPER CONCERNS IN U. S. — Continued

McEwan, R. W., Jr., Pres., Treas.
McGilla, Adele T., Vice-Pres.
McGinley, F. J., Pres.
McIlravy, W. N., Chairman, Barrett Co.
McIllvain, F. Huston, Vice-Pres.
McIllvain, J. Gibson, Pres.
McIntyre, E. F., Vice-Pres.
McIntyre, W. E., Pres. and Treas.
McIver, R. S., Treas.
McKay, Wm. O., Vice-Pres.
McKee, E. L., Vice-Pres.
McKeon, Mrs. Fannie F., Pres.
McLaren, F., Vice-Pres. and Treas.
McMahon, K., Sec.-Treas.
McMillen, C. R., Vice-Pres.
McNally, Frank E., Chairman of Board
McVicker, Hector, Pres.
Mabee, D. W., Sec.
Macy, Frederick E., Pres.
Madden, M. L., Pres.
Madden, Russell S., 1st Vice-Pres.
Magnus, Carl, Vice-Pres.
Mahart, A. H., Treas.
Maher, C. G., Vice-Pres.
Mahler, Ernst, Exec. Vice-Pres., Pres.
Main, F. W., Vice-Pres.
Main, Roger L., Treas.
Maltby, R. B., Vice-Pres.
Manton, David M., Sec.
Mansell, O. S., Vice-Pres.
Marcuse, I. J., Vice-Pres. and Sec.
Marcuse, James E., Vice-Pres.
Marcuse, John A., Vice-Pres.
Marcuse, M. E., Pres., Vice-Pres
Marcuse, Moses M., Treas.
Margeson, D. H., Treas.
Marion, Clarke, Vice-Pres.
Marquand, E. U., Vice-Pres.
Marshall, J. W., Pres.
Marshall, T. C., Treas.
Marshall, W. C., Partner
Marston, W. B., Treas.
Martin, A. B., Exec. Vice-Pres.
Martin, A. H., Treas.
Martin, C. B., Vice-Pres.
Martin, M. J., Pres.
Mason, Mrs. Herbert Warren, Sec.-Treas.
Mason, J. O., Vice-Pres.
Mason, Wm. H., Vice-Pres.
Massey, Peter J., Vice-Pres.
Massie, J. P., Vice-Pres.
Mateer, R. C., Vice-Pres.
Mather, S. L., Vice-Pres.
Matthew, Harry E., Pres.
Maull, William R., Vice-Pres.
Maurer, J. E., Vice-Pres. and Treas.
Maurer, L. J., Vice-Pres.
Maxcy, E. H., Sec.
May, F. E., Vice-Pres.
Maybee, G. W., Pres. and Treas.
Maynard, Nelson, Vice-Pres.
Mazer, A., Pres. and Treas.
Mazer, Abraham, Pres.
Mazer, Jacob, Pres., Treas.
Mazer, Joseph M., Treas., Sec.
Mazer, William, Vice-Pres.
Mead, Geo. H., Pres., Chairman
Mead, George W., Pres.
Mead, Henry S., Pres. and Treas.
Mead, Stanton W., Vice-Pres. and Treas.
Mead, W. L., Vice-Pres.
Medoff, William, Pres.
Megargee, G., Sec.
Megargee, Irwin F., Vice-Pres.
Meier, Hugo, Sec.
Merle, Lawrence, Vice-Pres.
Merlin, W. B., Vice-Pres.
Metz, Conrad, Vice-Pres.
Metz, Rudolph J., Treas.
Metz, Werner P., Pres.
Meunier, L. J., Vice-Pres.
Meyer, E., Treas.
Meyer, Ely, Pres. and Treas.
Meyer, P. A., Treas.
Michaelson, H. A., Sec.
Michaelson, H. Leonard, Pres.
Mildren, Brig. Gen., W. F., Pres.
Milham, A. B., Sec.
Milkey, L. E., Pres.
Miller, A. H., Exec. Vice-Pres.
Miller, A. W., Vice-Pres.
Miller, Charles A., owner
Miller, E. H., Sec.
Miller, F. A., Pres.
Miller, J. H., Vice-Pres.
Miller, John R., Vice-Pres.
Miller, Jos. S., Vice-Pres.
Miller, W. W., Vice-Pres.
Mills, Edward M., Pres.
Milner, C. E., Sec.-Treas.
Minskey, S. V., Pres.
Mister, B. G., Sec.-Treas.
Mitchell, A. P., Sec.
Mitchell, E. A., Sec.-Treas.
Mitchell, F. B., Pres.
Mitchell, M. B., Pres.
Moeller, W. J., Vice-Pres.
Mohan, Wm. F., 1st Vice-Pres.
Monroe, S. B., Sec., Treas.
Moon, Julia, A., Treas.
Moore, Paul F., Pres.
Moore, R. A., Vice-Pres.
Morgan, C. B., Vice-Pres.
Morian, C. H., Pres.
Morr, A. J., Treas.
Morrill, P. E., Sec.
Morrill, R. H., Vice-Pres.
Morse, G. Stanley, Pres.
Mory, Milsom B., Vice-Pres.
Moses, H. A., Pres.
Moyer, O. E., Vice-Pres.
Muehlberg, W. T., Vice-Pres.
Muehleck, E., Pres.
Muench, C. G., Vice-Pres.
Muessman, Vincent, Prop.
Mullin, J. L., Vice-Pres.
Munger, C. S., Vice-Pres.
Munger, R. P., Pres., Treas., Vice-Pres.
Munro, W. A., Pres.
Munson, W. D., Vice-Pres.
Murphy, Frank, Vice-Pres.
Murphy, T. F., Pres.
Murray, Earle, Pres.
Musser, R. D., Treas.

N

Naber, C. F., Pres.
Nachlup, Gustav, Pres.
Neher, F. H., Vice-Pres.
Nelson, B. F. II, Pres.
Nelson, C. E., Pres.
Nelson, P. P., Vice-Pres. and Treas.
Nelson, Robert F., Vice-Pres.
Newcombe, Albert, Treas.
Newcomber, S. J., Vice-Pres.
Newman, David, Pres.
Newman, Esther, Sec.-Treas.
Newman, N. E., Pres.
Newton, Arthur L., Sec.
Newton, Herbert B., Pres. and Treas.
Nichols, D. P., Sec.
Nichols, H. W., Pres.
Nicolson, G. L., Pres.
Nicolson, L. D., Sec.-Treas.
Nold, J. H., Vice-Pres.
Norton, E. H., Pres.
Norton, J. Albert, Vice-Pres.

OFFICERS OF PAPER CONCERNS IN U. S. — Continued

Norton, N. T., Treas.
Norton, S. C., Sec.-Treas.
Norton, W. J., Treas.
Nunez, Vasco E., Vice-Pres.

O

Oberdorfer, Max, Pres.
Obermanns, H. F., Vice-Pres.
Oberne, John E., Pres. and Treas.
Oberweiser, D. E., Vice-Pres.
Oberweiser, E. A., Pres.
O'Brien, E., Vice-Pres.
O'Connell, W. G., Treas.
O'Connor, George E., Pres.
O'Connor, J. J., Vice-Pres.
Oermann, Carl H., Pres.
Ohea, R. H., Sec.
Oliver, H. S., Treas.
Olmsted, George, Jr., Vice-Pres.
Olsson, Elis, Pres., Vice-Pres.
Olwell, Lee E., Pres.
O'Malley, Michael J., Pres.
O'Neal, C. B., Treas.
Osborne, W. Irving, Jr., Pres.
Osmund, T., Sec., Tumwater Paper Mills Co.
Ostrander, George N., Vice-Pres. and Sec.
Otto, G. G., Vice-Pres. and Gen. Mgr.
Overmiller, J. C., Sec.
Outerbridge, Basil, Pres., Sec.
Outerbridge, Herbert A., Vice-Pres.
Oxenham, W. T., Sec.
Ozurovich, John, Pres. and Treas.

P

Pace, A. D., Vice-Pres. and Treas.
Pace, J. C., Vice-Pres.
Paddock, H. Lester, Pres.
Paepcke, Walter P., Pres.
Page, Robert L., Sec. and Treas.
Paine, A. G., Chairman of the Board
Paine, Charles G., Vice-Pres.
Paine, Eustis, Pres.
Paine, Peter, 1st Vice-Pres.
Palamountain, P. R., Treas.
Palmer, Edward, Pres.
Palmer, E. M., Vice-Pres.
Parant, L. J., Vice-Pres.
Park, M. A., Vice-Pres.
Parker, C. G., Vice-Pres.
Parker, H. O., Vice-Pres. and Treas.
Parrish, J. Scott, Treas.
Parsons, M. F., Vice-Pres.
Pasco, Franklin E., Sec.
Patten, Z. C., Vice-Pres.
Patterson, D. H., Jr., Pres.
Patton, E. W., Sec.-Treas.
Peabody, George R., Pres.
Peabody, L. C., Sec.-Treas.
Pearsall, J. H., Treas.
Pease, R. L., Vice-Pres.
Peavey, H. J., Sec.-Treas.
Peavey, W. M., Pres.
Peck, T. W., Sec.
Pelkey, H. H., Sec.
Penfield, A. R., Vice-Pres.
Penfield, W. E., Vice-Pres.
Penney, Charles P., Sec.
Pepper, G. Willing, Treas.
Perkins, Benjamin F., Pres.
Perkins, J. Lewis, Jr., Treas.
Perkit, Charles, Pres.
Perkit, Edward, Treas.
Perry, F. Gardiner, Sec.-Treas.
Perry, F. J., Pres.
Perry, Kenneth, Sec.
Peters, F. A., Sec.
Petty, Fred J., Sec.
Pfeitter, W. F., Sec.-Treas.
Phelan, Sidney M., Vice-Pres.
Phillips, D. F., Sec.
Picola, Benjamin F., Vice-Pres.
Pierce, Arthur J., Pres.
Pierce, L. A., Vice-Pres.
Pierce, R. C., Sec.
Pike, Cecil M., Sec.
Pilcher, L. H., Vice-Pres.
Pilz, W. J., Vice-Pres. and Sec.
Plantier, Edward D., Vice-Pres.
Plum, E. Gaddis, Vice-Pres.
Plumstead, Joseph E., Sec.
Plunkett, A. T., Vice-Pres.
Pomeroy, A. D., Treas.
Pomeroy, Brenton C., Pres.
Porter, Andrew, Vice-Pres.
Porter, F. T., Vice-Pres.
Powers, P. A., Sec.
Powers, Ralph A., Pres.
Pratt, C. Walter, Vice-Pres.
Prentis, H. W., Jr., Pres.
Preston, H. R., Vice-Pres. and Sec.-Treas.
Preston, Marvin, Vice-Pres.
Preu, B. O., Vice-Pres.
Prince, F. M., Vice-Pres.
Prince, J. F., Treas.
Pritchard, Lysle E., Board of Directors
Puett, Ross, Pres.
Purinton, R. E., Sec.
Pyl, J. A., Vice-Pres.
Pyl, John, Sec.
Pyle, Horace A., Treas.

Q

Quirk, D. L., Jr., Pres.

R

Race, W. W., Sec.
Race, William, Sec.-Treas.
Ralph, S. H., Vice-Pres.
Ralston, R. M. Vice-Pres.
Ramage, James B., Vice-Pres.
Randall, H. T., Vice-Pres.
Randall, J. Edwin, Sec.
Rankin, W. P., Sec.-Treas.
Ransom, W. E., Exec. Vice-Pres.
Ratcliff, A., Pres.
Rathbun, O. N., Treas.
Rau, Irving T., Sec.-Treas.
Rauch, H. Lee, Pres.
Raymond, H. E., Pres.
Raymond, W. L., Vice-Pres.
Read, Gordon M., Pres. and Treas.
Read, Robert E., Pres.
Ready, C. M., Sec.
Redford, E. B., Sec.
Reed, J. D. N., Sec.-Treas.
Reed, P. L., Pres.
Reeves, C. H., Vice-Pres.
Reichert, F. G., Vice-Pres.
Reid, E. C., Vice-Pres.
Reid, H. E., Sec.
Reider, B. I., Vice-Pres.
Remington, John A., Sec.
Remsen, T. R., Vice-Pres.
Rice, Philip E., Treas.
Rich, Wm. T., Jr., Pres.
Richardson, J. M., Chairman of Board
Richardson, Paul, Sec.
Richardson, W. H., Vice-Pres.
Richmond, Geo. L., Pres.
Rickard, Edgar, Pres.
Riegel, B. D., Chairman of Board.
Riegel, John L., Pres.
Riendeau, A., Sec.-Treas.
Rieser, Norvin H., Pres.
Riis, Erling, Vice-Pres.
Robbins, Harry, Vice-Pres.

OFFICERS OF PAPER CONCERNS IN U. S. — Continued

Roberts, B. H., Pres.
Roberts, C. H., Treas.
Roberts, W. M., Sec.-Treas.
Robertson, Geo., E., Vice-Pres.
Robertson, H. J., Jr., Pres.
Robertson, Reuben B., Exec. Vice-Pres.
Robertson, Reuben B., Jr., Vice-Pres.
Robertson, Robert H., Pres. and Treas.
Robineau, S. P., Sec.
Robinson, F. G., Vice-Pres.
Rock, Roger J., Vice-Pres.
Rogers, Dudley P., Pres.
Rogers, Elliot, Pres.
Rogers, F. S., Vice-Pres.
Rogers, Henry G., Vice-Pres.
Rogers, Leon B., Treas.
Rogers, P. H., Vice-Pres.
Rogerson, W. W., Treas.
Rome, Doris R., Vice-Pres.
Rome, Irwin H., Pres.
Rome, Irwin W., Sec.
Rose, Alice M., Sec.
Rose, E. P., Pres. and Treas.
Rosenfeld, Louis, Vice-Pres.
Rosenfeld, M., Treas.
Rosenthal, Dunbar A., Pres. and Treas.
Rosenthal, Leroy A., Vice-Pres.
Ross, D. L., Vice-Pres.
Rowe, J. J., Vice-Pres.
Rowe, P. C., Vice-Pres.
Rhoads, Ralph E., Sec.
Rhodes, C. G., Sec.
Ruckert, H. E., Vice-Pres.
Ruder, Geo. L., Vice-Pres.
Rushton, H. J., Sec.
Russell, H. M., Pres. and Treas.
Russell, S., Vice-Pres.
Ryland, J. F., Vice-Pres.
Ryman, F. E., Treas.

S

Sage, C. H., Vice-Pres.
Sager, Carl E., Pres.
Sager, Elizabeth N., Treas.
St. Laurent, R. A., Vice-Pres.
Sall, Samuel, Sec.
Sanders, G. C., Vice-Pres.
Sandroff, A. E., Pres.
Sanger, J. P., Vice-Pres.
Satink, Dorothy, Treas.
Sawyer, C. J., Pres.
Schacker, C. H., Sec.
Scheid, A. B., Treas.
Schilling, P. A., Pres.
Schlesinger, A. L., Pres.
Schmidt, Carl R., Vice-Pres.
Schmidt, Henry D., Pres. and Treas.
Schmidt, Herman H., Treas.
Schmidt, Richard, Pres.
Schneller, F. J., 2nd Vice-Pres.
Schnorbach, P. P., Pres.
Schnorbach, P. W., Vice-Pres. and Treas.
Schoener, Harry B., Treas.
Schoning, Otto A., Vice-Pres.
Schoo, C. J., Vice-Pres.
Schorger, A. W., Pres.
Schroeder, Arthur, Vice-Pres.
Schuh, M. A., Vice-Pres.
Schultz, Alwin A., Sec.-Treas.
Schultz, V. S., Sec.
Schwartz, J. H., Treas.
Schweitzer, Louis, Pres.
Schweitzer, William, Vice-Pres.
Scott, J. S., Treas.
Scott, W. C., Vice-Pres.
Scott, William R., III, Sec.
Seaborne, C. R., Vice-Pres. and Treas.
Sebright, John C., Sec.
Seeger, G. R., Vice-Pres.
Sells, Geo. M., Treas.
Sengle, Robert L., Vice-Pres. and Sec.
Sensenbrenner, F. J., Pres.
Sensenbrenner, J. S., Vice-Pres.
Sensenbrenner, R. M., Vice-Pres.
Senseney, George, Pres.
Shafer, W. F., Jr., Sec.
Shafer, W. F., Sr., Pres.
Shaffer, Wm. R., Pres.
Shainwald, R. H., Exec. Vice-Pres.
Shainwald, R. S., Chairman
Shapiro, J. J., Sec.
Shapiro, J. M., Pres. and Treas.
Shattuck, S. F., Vice-Pres.
Shaver, C. H., Sec.-Treas.
Shearer, Walter V., Vice-Pres.
Sheedy, Michael, Sec.-Treas.
Sheedy, Winthrop L., Pres.
Sheehan, W. B., Vice-Pres. and Treas.
Sheil, Joan E., Sec.
Sherman, Elmer, Sec. and Treas.
Sherman, Elmer A., Treas.
Sherman, Raymond R., Pres.
Shilling, H., Vice-Pres.
Shoemaker, W. M., Sec.
Shortal, P. E., Treas.
Shortess, W. G., Pres.
Showalter, Arthur H., Vice-Pres.
Shryock, O. A., Pres.
Shryock, S. S., Jr., Sec.-Treas.
Shuro, John M., Vice-Pres.
Silk, Chas. R., Treas, Vice-Pres.
Silk, F. B., Pres.
Silk, F. F., Sec.
Silk, J. A., Vice-Pres.
Silverstein, S. M., Vice-Pres.
Simeral, R. W., Vice-Pres.
Simmonds, H. J., Vice-Pres.
Simmons, C. A., Vice-Pres.
Simon, Harry C., Pres.
Simpson, I. M., Vice-Pres.
Sinclair, F. D., Vice-Pres.
Sinclair, G. R., Sec.-Treas.
Sisson, Chas. H., Vice-Pres.
Sisson, F. T. E., Sec.
Sisson, Geo. W., Jr., Pres.
Sisson, Walter C., Treas.
Sitzer, E. A., Pres.
Skinner, E. W., Vice-Pres.
Slaughter, John A., Exec. Vice-Pres. and Treas.
Sloan, Hugh W., Sec.-Treas.
Slocum, C. H., Sec.
Smead, J. W., Vice-Pres.
Smeallie, J. Donald, Pres. and Sec.
Smiley, M. D., Treas.
Smith, Albert E., 1st Vice-Pres.
Smith, A. F., Vice-Pres.
Smith, Carlton R., Treas.
Smith, C. V., Sec.
Smith, C. W., Pres., Treas.
Smith, C. Wylie, Vice-Pres.
Smith, D. A., Vice-Pres.
Smith, D. B., Sec.-Treas.
Smith, Edward C., Sec.
Smith, Franklin E., Treas.
Smith, Fred L., Sec.
Smith, H. A., Sec.
Smith, J. E., Pres.
Smith, J. E., Jr., Vice-Pres.
Smith, John H., Pres.
Smith, K. S., Pres.
Smith, M. E.,
Smith, M. N., Pres.
Smith, Marshall, Vice-Pres.
Smith, Mary A., Treas.
Smith, Mowry, Treas.
Smith, Murray, Sec.
Smith, R. W., Vice-Pres.

OFFICERS OF PAPER CONCERNS IN U. S. — Continued

Smith, Ralph S., Sec.
Smith, Roger D., Pres.
Smith, Roger P., Sec.
Smith, Thomas W., Sec.
Snideman, R. L., Pres.
Snow, Roger V., Sec.
Snow, William B., Treas.
Snyder, Gordon, Sec.-Treas.
Snyder, J. Leslie, Vice-Pres.
Southon, A., 1st Vice-Pres.
Southworth, Constant, Vice-Pres.
Southworth, Edward, Sec.-Treas.
Southworth, Melvin D., Pres.
Spachner, J. V., Vice-Pres.
Spade, C. I., Vice-Pres.
Spafford, H. H., Vice-Pres.
Spaulding, H. N., Pres., Treas.
Spaulding, R. H., Pres.
Spencer, R. W., Pres. and Treas.
Spiegel, E. J., Vice-Pres. and Treas.
Sprague, W. S., Pres.
Stagmater, John, Pres.
Stagmater, Hubert J., Treas.
Staley, Laurie, Sec.-Treas.
Stansbury, Karl E., Pres.
Stanton, F. J., 2nd Vice-Pres.
Stanton, Seabury, Pres.
Stearns, G. M., Jr., Pres.
Stearns, L. N., Treas.
Stedman, C. E., Vice-Pres.
Steed, Leonard L., Vice-Pres.
Steele, R. W., Vice-Pres.
Stegman, L. H., Vice-Pres.
Steinetz, B. G., Vice-Pres. and Treas.
Stern, Geo. K., Sec.
Stern, Louis F., Vice-Pres.
Stern, R., Pres. and Treas.
Stevens, C. N., Pres. and Treas.
Stevens, Frank L., Chairman of Board
Stevens, Fred N., Vice-Pres.
Stevens, John, Jr., Vice-Pres.
Stevenson, E. P., Pres.
Stewart, E. P. Sec.
Stille, J. L., Vice-Pres.
Stilson, L. A., Vice-Pres.
Stocker, D. L., Pres.
Stone, Avery J., Treas., Sec.
Stone, N. S., Sec.
Stone, Robert M., Pres.
Storey, O. W., Sec.
Storrs, John T., Vice-Pres.
Story, Austin P., Vice-Pres. and Treas.
Stouck, V. W., Vice-Pres., 2nd Vice-Pres.
Stowitts, F. H., Sec.
Strange, Hugh, Sec.-Treas.
Strange, John G., Sec.
Strange, M. M., Pres.
Strange, Paul, Vice-Pres.
Strassburger, William, Treas.
Straus, Harry H., Pres.
Stringfellow, Jr., B. B., Sec.
Strouse, E., Sec.
Stuart, Kimberly, 2nd Vice-Pres. and Sec.
Stuhr, William S., Pres.
Sucy, Irma P., Sec.
Sullivan, Francis R., Vice-Pres.
Sullivan, J. L., Sec.-Treas.
Suter, F. L., Vice-Pres.
Suter, James F., Sec.
Sutherland, L. W., Pres.
Sutphin, Samuel B., Pres.
Sutphin, Stuart B., Vice-Pres.
Sutphin, Samuel R., Sec.
Sutter, H. W., Vice-Pres.
Swan, Douglas L., Vice-Pres. and Sec.-Treas.
Swan, H. B., Pres.
Swaney, Robert M., Sec.
Swartwood, Howard A., Sec.
Sweet, B. W., Treas.
Sweet, J. M., Vice-Pres.
Sweet, R. W., Pres.
Symington, F. W., Vice-Pres.

T

Taft, J. B., Vice-Pres.
Taggart, B. B., Chairman of Board
Taggart, J. W., Vice-Pres.
Taliaferro, Van Buren, Sec.
Tarbell, G. H., Vice-Pres.
Taylor, F. E., Vice-Pres. and Sec.
Taylor, J. F., Vice-Pres.
Taylor, John M., Pres.
Taylor, Lane, Sec.-Treas.
Taylor, T. C., Treas.
Taylor, Wm. H., Sec.
Telfer, H. R., Pres.
Temple, Arthur, Vice-Pres.
Tepper, G. Willing, Treas.
Teren, N. G., Vice-Pres.
Thayer, H. C., Treas.
Thickens, J. H., Vice-Pres.
Thomas, B. W., Pres.
Thomas, M. A., Pres. and Treas.
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Thompson, Alexander, Jr., Vice-Pres.
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Statistical Table of Paper Making Concerns in the United States and Canada

THE table presented herewith shows the number of concerns engaged in the manufacture of pulp and paper in the United States and Canada and the number of pulp and paper mills operated. This data is taken from the 1941 edition of Lockwood's Directory of the Paper and Allied Trades which is now on the press and which will be issued shortly.

Earlier Statistics Compared

The information given in this table is especially interesting when compared with earlier statistics. Probably the most reliable of the early statistics of the industry were those returned to congress by Tench Coxe of Philadelphia, a recognized statistician and economist in 1813. These statistics reported mills in eighteen states with a total of 202. Pennsylvania easily led the list, having 64 as compared to New York 28, Massachusetts 23, Connecticut 19, New Jersey 14 and Vermont 11.

These statistics were not regarded as very accurate, but they were a great improvement over any figures that had been available previously.

First Statistics in Lockwood Directory

Lockwood's Directory, which was first issued in 1873, presented its first statistical table for 1873 and 1875 in its second edition printed in 1875. This gave the number of concerns in 1873 as 712 which operated 819 mills. This compared with 773 concerns which operated 896 mills in 1875. By the time the 1873 statistics were published, New York had gained a commanding lead in the industry, having 176 concerns which operated 191 mills. Its nearest competitor was Massachusetts, but there were only 91 concerns there which operated 135 mills. Pennsylvania came next with 84 concerns, operating 94 mills, and then followed Connecticut with 76 concerns operating 78 mills, New Jersey with 37 concerns operating 37 mills, New Hampshire with 29 concerns operating 33 mills, Maryland with 23 concerns operating 28 mills and Illinois with 18 concerns operating 21 mills.

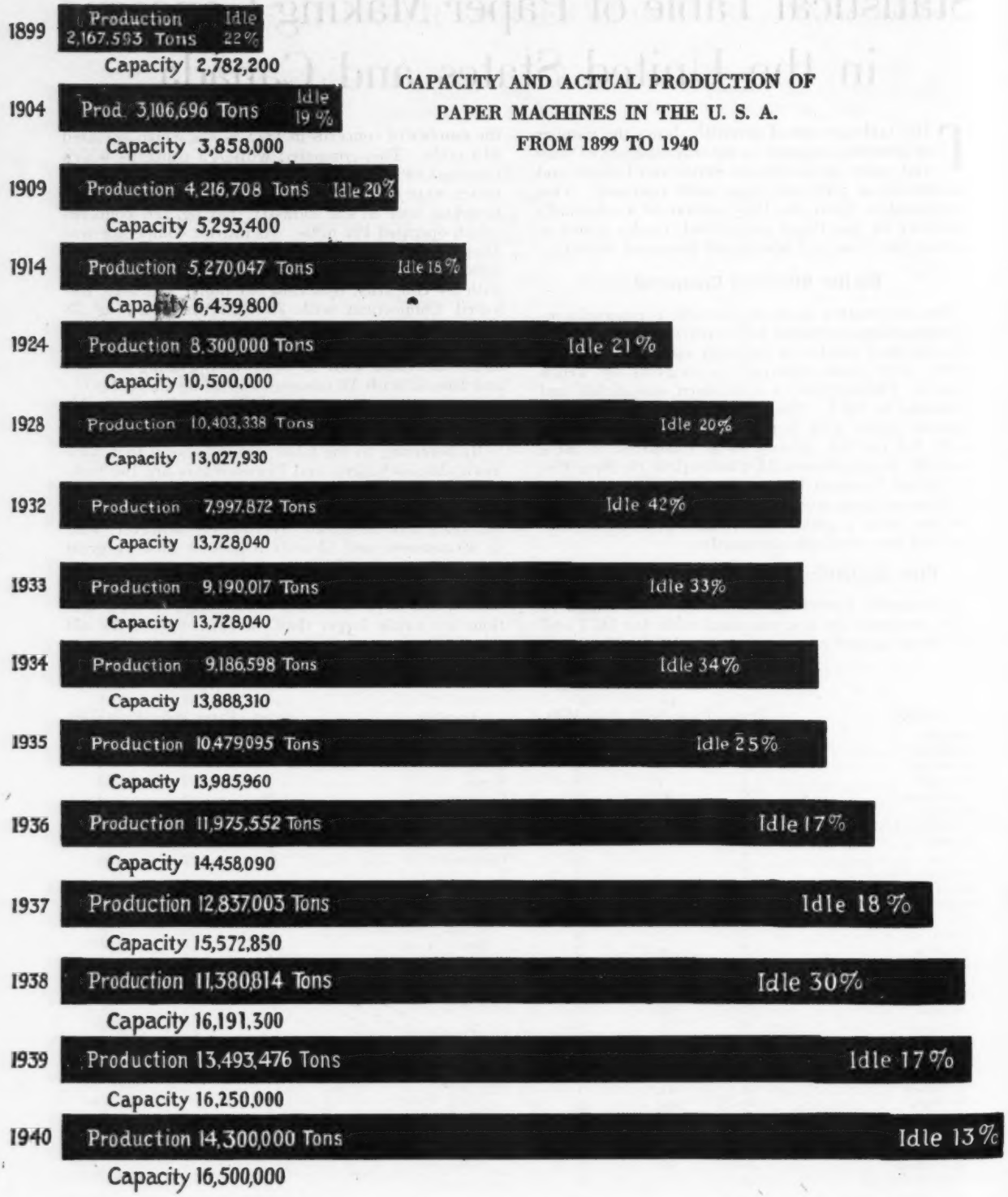
The Leading States

By referring to the table, it will be seen that New York, Massachusetts and Pennsylvania are the leading states as regards the number of concerns and mills just as they were when the first Lockwood Table for 1873 was published. Wisconsin, however, with its 40 concerns and 52 mills at present shows a great gain as do the Pacific Coast and the Southern States. It must be remembered also that the capacities of the mills which have been built in late years in these sections are vastly larger than the capacities of the old time mills.

Location	Number of Firms	Number of Paper Mills	Number of Pulp Mills
Alabama	5	5	5
Arkansas	2	2	2
California	10	13	0
Colorado	1	1	0
Connecticut	27	31	0
Delaware	5	6	0
District of Columbia	1	1	0
Florida	8	6	6
Georgia	5	3	3
Hawaiian Islands	1	1	1
Illinois	21	26	0
Indiana	14	16	0
Iowa	3	4	0
Kansas	2	2	0
Louisiana	7	8	7
Maine	20	25	33
Maryland	9	9	1
Massachusetts	59	88	3
Michigan	37	54	9
Minnesota	8	11	11
Mississippi	4	4	3
Missouri	1	1	0
New Hampshire	22	30	7
New Jersey	33	41	1
New York	99	119	46
North Carolina	8	8	6
Ohio	45	49	3
Oregon	7	6	11
Pennsylvania	46	53	11
Philippine Islands	1	1	1
Rhode Island	1	1	0
South Carolina	4	4	4
Tennessee	8	8	3
Texas	3	2	2
Vermont	8	8	3
Virginia	13	14	10
Washington	15	13	26
West Virginia	5	5	0
Wisconsin	40	52	36
Total	535*	731	254
Canada:			
British Columbia	5	4	8
Manitoba	1	1	2
New Brunswick	6	4	10
Nova Scotia	5	1	6
Ontario	30	35	35
Quebec	40	47	52
Total	84*	92	113
Newfoundland	2	2	5
Idle Mills:			
United States	43	50	7
Canada	7	4	8
Newfoundland	1	0	1

* Firms listed in several States and Provinces in which they have mills but deductions made for duplicates in totals for United States and Canada.

CAPACITY AND ACTUAL PRODUCTION OF PAPER MACHINES IN THE U. S. A. FROM 1899 TO 1940



Paper Production Shows Steady Expansion

THE notable stability of the paper industry is primarily due to the great utility of its many products. Paper has become a necessity and new and important uses for various kinds of paper and for wood pulp, which is the most important basic material from which the bulk of paper, paper board and other paper products is manufactured, are constantly being found.

An examination of the chart on the opposite page will show the steady expansion of the industry. This growth has been rapid and sustained and very few of the older major industries in the United States can equal the progress made by the paper industry. In a late analysis of the data compiled by the National Conference Board and the American Paper and Pulp Association, it was shown that, compared on an index basis with agriculture, mining, manufacturing, and railway and telegraph, only the mining industry shows an increase comparable with the paper industry during the last century.

Paper Output Continues to Increase

In comparison with mining production, the paper industry has continued to expand, while mining has leveled off and has made little advance in the decade from 1920 to 1930. In railways and telegraphs expansion since 1920 has been very small and the present trend is downward. The 1929 production of automobiles has never been surpassed, while the chart on the opposite page shows that the 1929 production of paper totaling 11,140,235 tons, was surpassed in 1936 with 11,975,552 tons, in 1937 with 12,837,003 tons, in 1939 with 13,441,500 tons, and in 1940 with an estimated production of 14,300,000 tons.

As the manufacture of paper is a huge industry, with its products valued at more than $1,000,000,000, and its investment in land, buildings and equipment also more than $1,000,000,000, there are few, if any, other industries offering a more valuable market for the sale of equipment and supplies than the American paper industry. In making even a casual survey of the paper industry it will at once be noted that, compared with other major industries, the paper industry has a somewhat high plant investment per dollar of manufactured product. In other words, for every 1.6 dollar of products manufactured yearly, a dollar of investment in plant is required. Other industries, such as food, textiles and rubber, do not require as high an investment ratio. The paper industry has also a high ratio of salaries and labor. The reason why a large unit investment is required, is that much expensive equipment and supplies are necessary for the mass production of paper and paper products. Quality in equipment and materials is of great importance.

The paper industry requires a high proportion of technically trained and skilled workers. The numerous technical-control and research operations in making wood pulp alone, require the services of chemists and chemical engineers. A sheet of paper is made on a highly complicated Fourdrinier paper making machine, tended by an expert paper maker who must be a highly skilled workman. Throughout the mill, in both paper and pulp production, a staff of highly technically trained men, with a low plant ratio in common labor, are important factors in the rapid progress made by the industry.

The interest of the paper industry in the national economy in the forest situation, is of great importance. In the value of its products, the paper industry ranks high among other forest industries but its wood requirements are still relatively unimportant in volume, although 9,368,013 cords of pulpwood were consumed by domestic mills in 1937.

Notable Increase in Productive Efficiency

Increases in productive efficiency in the paper and allied products industry since the early 'twenties are, according to a recent survey made by The Brookings Institution, of Washington, D. C., reaching the consumer in the form of price reductions amounting to $172,000,000 annually. From 1923 to 1938 man-hour productivity increased 52 per cent, thus enabling the consumer of paper to purchase 40 per cent more for his money. Output, increasing 50 per cent, kept pace with productivity and, although working hours were substantially reduced, the number of workers increased 12 per cent, and hourly wages rose 8.6 per cent. Total dollar earnings increased 7 per cent, thus labor gained in buying power as well as in substantially increased leisure.

Important Technological Advances Continue

Any study of the present economic status and notable stability of the paper industry must disclose that the advancing trend in the industry is largely contributed by technological developments within the industry, which not only finds new uses for paper and paper products, such as the paper board container, barrel or drum, paper board building materials simulating tile and many other fine finishes, but also new uses for wood pulp in the manufacture of textiles and in plastics. The paper board container division of the industry is one of the most rapidly expanding enterprises and paper board shipping containers continue to replace wood shipping packages. One of the latest examples in which paper board is about to be substituted for wood, is that of the 30-dozen egg shipping case. Many other uses of paper in some form substituting other materials long used could be mentioned but the very few given are sufficient to indicate a steady expansion and a sustained stability for the paper industry in the future.

Achievements of Technical Association of the Pulp and Paper Industry

ABOUT 25 years ago there was formed the Technical Section of the American Paper and Pulp Association, the forerunner of the Technical Association of the Pulp and Paper Industry, for the purpose of bringing about improved conditions in the manufacture of pulp and paper, especially in regard to the advancement in the technical and scientific aspects.

The preliminary meeting for organization of the Technical Section was held on February 18, 1915 at the annual meeting of A.P.P.A., and the actual organization was effected in Chicago, Ill. on May 6, 1915. The first general meeting was held in Grand Central Palace, New York, N. Y. on September 23, 1915 at which time a constitution was adopted. The objects of the section as stated in the constitution were: (1) to stimulate interest in the science of pulp- and papermaking; (2) to provide means for the interchange of ideas among its members; (3) to encourage original investigation.

T. J. KEENAN W. G. MACNAUGHTON A. G. MACDONALD

The organization committee consisted of: Henry E. Fletcher, Fletcher Paper Company; W. G. MacNaughton, Nekoosa-Edwards Paper Company; Ernst Mahler, Kimberly-Clark Company; Charles F. Rhodes, International Paper Company; Henry F. Obermanns, Hammermill Paper Company; Ralph H. McKee, University of Maine, and Thomas J. Keenan, *Paper*.

At the meeting on September 23, 1915 the following committees were appointed.

EXECUTIVE COMMITTEE — H. E. Fletcher, chairman; W. G. Mac Naughton; Ernst Mahler; C. F. Rhodes; H. F. Obermanns.

SECRETARY-TREASURER—T. J. Keenan.

PUBLICATION COMMITTEE—C. F. Rhodes, H. F. Obermanns.

SODA PULP COMMITTEE—M. L. Griffin, chairman; S. D. Wells, Edwin Sutermeister.

SULPHATE PULP COMMITTEE—Otto Kress, chairman; J. E. Hedin, G. S. Holmes.

SULPHITE PULP COMMITTEE — R. B. Wolf, chairman; Frederic C. Clark; C. C. Heritage.

STANDARD METHODS OF TESTING MATERIALS USED IN THE MANUFACTURE OF PAPER COMMITTEE — H. P. Carruth, chairman, R. C. Hatch; Max Cline.

GROUNDWOOD COMMITTEE—D. L. Bellinger, chairman.

In the latter part of 1915 a prize competition was instituted for papers or monographs dealing with the solution of the following technical problems for which $100 was offered for the best paper on each subject:

(1) The various causes for the deterioration of the Fourdrinier wires and steps to be taken in the prolongation of the life of the wires.

(2) How can pitch in sulphite pulp be eliminated?

(3) The effect of the order and time of alum, rosin, and color on the retention of color.

(4) The retention of the various mineral fillers used in papermaking and their effect on the life of the machine clothing and the quality of the paper.

H. E. FLETCHER

W. H. SWANSON

At the annual meeting on February 16-17, 1916 the Technical Section was reorganized on an independent basis as the Technical Association of the Pulp and Paper Industry (TAP-

PI), absolutely separate and distinct in its administration, maintaining its general interest in all that pertained to the industry. An editorial from *Paper* (Feb. 23, 1916) says in part: "This Technical Association is the baby of the paper trade family, nevertheless, it has given so marvelously that it has gained the strength to stand alone and speak for itself in an astoundingly short period. The membership has increased most encouragingly and the active, enthusiastic interest in the work of the association indicates the accomplishment of many good things in behalf of the industry. There is no branch of the trade more promising in important results. What has already been accomplished is but a slight indication of what may be expected."

W. G. MacNaughton, in reporting to the convention, on February 17, 1916, for the executive committee said: "We feel that the Technical Association of the Pulp and Paper Industry has been started on a firm basis, and we hope it will continue to grow in importance as well as numbers and quality, so as the years go by the Technical Association will be regarded as a high class engineering and technical association which will not only tend to the improvement of the quality of the members connected with the industry but also affect the practical operation of the mills, because after all any changes, particularly the practical mechanical results, are the results used to gage the success of any association."

Present Status

In this Silver Anniversary year the membership numbers over 1900 engineers, executives, chemists, superintendents, supervisors, and students. Corporate Members, pulp and paper manufacturers, number 84; and Sustaining Members, companies in a related industry or service, number 95. There are TAPPI members in every papermaking country in the world today.

The growth in membership and service to the pulp and paper and related industries has fully justified the initiative and labors of the founders. From small discussion groups TAPPI has grown so that the national conventions are divided in sessions dealing with the various phases of the industry covering a multiplicity of subjects each presented by a specialist and then discussed in open forum. About one hundred papers were presented at the 1940 Annual Meeting.

Two national conventions are held each year, the Annual Meeting is held in New York City during the last full week of February; and the Fall Meeting is held in various papermaking centers in the fall. These meetings provide means for the interchange of ideas and information for the advancement of the science and manufacture of pulp and paper. Most of the papers are published in *Paper Trade Journal*, the official publication of TAPPI and all meeting papers, discussions, and reports are published in *Technical Association Papers*, a cloth-bound volume of 750 pages.

Local Sections

As TAPPI grew larger and its value become more apparent, the need for regional activities was solved by the formation of local sections. Local groups are given a charter by TAPPI when they have shown their ability to function under their own leadership. In seven regions there are local sections chartered by TAPPI, and they are known as: Pacific Section, organized in 1929, at Seattle, Wash.; Lakes States Section, organized in 1930 at Menasha, Wis.; Delaware Valley Section, organized in 1931 at Philadelphia, Pa.; Kalamazoo Valley Section, organized in 1931 at Kalamazoo, Mich.; New England Section, organized in 1932 at Holyoke, Mass.; Ohio Section, organized in 1934 at Middletown, Ohio; and the Empire State Section, organized in 1935 at Syracuse, N. Y.

In addition the Southern Pulp and Paper Club, made up largely of TAPPI members although not a local section, holds meetings in southeastern cities. In June, 1940 there was formed an organization of TAPPI members from northern New England known as the Proposed Maine-New Hampshire Section.

Divisions and Committees

The division and committee organization of TAPPI constitutes the principal means within the association for the collection and dissemination of technical knowledge either by codification of existing knowledge for easy use and reference or by the planned production of new knowledge.

Each division is made up of appropriate committees and these are frequently divided into subcommittees to do special work. The entire divisional organization works under the administrative direction of the vice president who works directly with the division chairman and the Secretary.

There are seven divisions: Engineering; Industrial; Converting and Consuming; Research Development; Pulp Manufacture; Paper Manufacture, and Testing. There are also miscellaneous committees and delegates to other organizations. Under the Engineering Division, there are the following committees: Heat and Power, Materials of Construction, and Water Committee. Under the Industrial Division, the following committees function: Fibrous Raw Materials, Industrial Engineering, and Nonfibrous Raw Materials. Under the Converting and Consuming Division are the following committees: Coating, Container, and Graphic Arts. Under the Research Development Division are the following committees: Abstracts and Bibliography, Fundamental Research, Bacterial Control Methods, and Patents. Under the Pulp Manufacture Division are the following committees: Acid Pulping, Alkaline Pulping, Mechanical Pulping, and Pulp Purification. Under the Paper Manufacturing Division are the following committees: Preparation of Nonfibrous Materials, Stuff Preparation, and Forming and Finishing. Under the Testing Division are the following committees: Fibrous Materials Testing, Pulp Testing, Nonfibrous Materials Testing,

Chemical Methods Coordination, Microscopical Analysis, Paper Testing, and Optical Properties. The miscellaneous committees consist of the Finance, Standards, Research Appropriation, Certified Pulp Testers Bureau, and Joint Textbook. There are TAPPI delegates to the following organizations, serving on various committees: American Society of Mechanical Engineers, American Society for Testing Materials, and the Inter-Society Color Council.

There are over 300 members serving on committees and subcommittees who give their services voluntarily and without renumeration.

The association is a member of, is affiliated with, or is represented in a number of organizations such as: the American Paper and Pulp Association; Technical Section, Canadian Pulp and Paper Association; Technical Section, Papermakers' Association of Great Britain and Ireland; Verein der Zellstoff und Papierchemiker u-Ingenieure; American Society for Testing Materials; American Society of Mechanical Engineers; and Inter-Society Color Council. The association is a Member of the Institute of Paper Chemistry.

BENEFITS TO MEMBERS

Each member of the Technical Association of the Pulp and Paper Industry receives the following publications as a part of his membership benefits:

Technical Association Papers, a cloth-bound volume of over 750 pages, containing the record of technical development of the pulp and paper and related industries. It contains the annual and fall convention papers and reports of committees, issued annually.

Paper Trade Journal, a weekly containing the *TAPPI Section,* devoted to papers presented at national and local meetings, and contributed articles. Outside the technical section other material of general interest as news, market, construction, financial, and other reports are published.

TAPPI Year Book, an annual containing an alphabetical and geographical roster of members, together with a detailed record of all association activities, suggestions for authors, constitution, indexes to the standards and data sheets, and other useful matter.

TAPPI Standards, a loose-leaf manual containing the tentative, suggested, and official testing methods, specifications, and recommended practices.

TAPPI Data Sheets, a loose-leaf manual of engineering, chemical, and operating data for engineers, chemists, and other operating men.

TAPPI Bibliography of Paper Making and U. S. Patent List, a cloth-bound volume issued annually and covering all books and periodicals dealing with the manufacture of pulp and paper.

The association assists the pulp and paper and related industries in obtaining employees to meet their requirements and assists its members in obtaining employment through the Secretary's office.

To further the services of TAPPI to its members and the industry, appropriations of money are made to assist committees in their activities. Research funds are administered by the Research Appropriations Committee with the approval of the Executive Committee.

Work TAPPI Has Done

WAR SERVICE

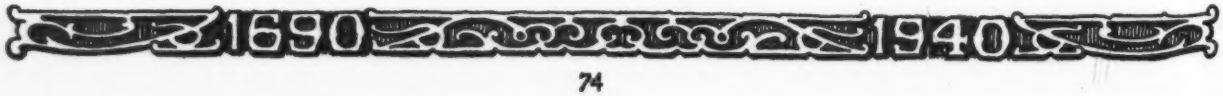
At the time the Technical Association of the Pulp and Paper Industry was organized, the World War of 1914-1918 was in progress. The part played by TAPPI was commenced at a meeting during the annual convention held on February 6, 1918. Milo R. Maltbie and Capt. H. C. Porter of the War Department addressed the meeting and stressed the extremely serious inadequacy of the supply of toluene. Toluene is essential in the manufacture of the high explosive trinitrotoluene (called TNT) and can be produced from liquors used in cooking spruce, balsam, etc. in the sulphite process. Capt. Porter pointed out the extreme urgency of securing every gallon of toluene possible. H. P. Carruth, then president of TAPPI, appointed a Toluene Committee to bring the matter to the attention of the industry. The committee consisted of H. E. Fletcher, chairman, F. M. Williams, W. E. Byron Baker, P. A. Paulson, H. F. Obermanns, M. W. Heddon, G. K. Spence, E. R. Barker, A. W. Nickerson, and L. H. Shipman.

In March, 1918 President Carruth appointed a War Service Committee of TAPPI composed of H. P. Carruth, chairman; G. E. Williamson, in charge of engineering problems; R. S. Hatch, in charge of chemical problems; H. E. Fletcher, in charge of pulp problems: T. J. Keenan, in charge of correspondence; and Frederic C. Clark, Washington representative. The development of the regulations that were issued by the Pulp and Paper Division of the War Industries Board showed the need of technical information on a great many points. One of these, the consumption of chlorine, was very forcibly brought out in connection with bleaching. Chlorine and its compounds was used in the World War in many different ways. One of the many uses of chlorine was in the production of deadly poison gases used in gas warfare. Another use was for the disinfecting of water supplies.

Some of the problems discussed by the TAPPI War Service Committee were: bleach, sulphur, wool, cotton, wrapping papers and paperboxes, universal standard size basis for all grades of paper, wood pulp for nitrocellulose, and rosin for sizing purposes.

PUBLICATIONS

The first volume of *Technical Association Papers* was published in 1918 in paper covers and consisted of 64 pages. In 1935 the binding was changed to cloth for greater durability and better appearance. The latest volume of *Technical Association Papers* Series XXIII published in June, 1940 contains 752 pages of scientific articles, addresses, reports of committees, and other useful matter.



The textbooks entitled Manufacture of Pulp and Paper published in five volumes resulted from a cooperative undertaking of the Technical Association of the Pulp and Paper Industry with the Technical Section of the Canadian Pulp and Paper Association. Over 31,000 volumes have been sold. The preparation, editing, and publication of the textbooks are done under the direction of the Joint Textbook Committee. These books are the most comprehensive, authentic, and up-to-date available in any language. They represent the very best modern practice and technique in the manufacture of pulp and paper. Each section was written by an expert in his line.

Another contribution of the Technical Association to the factual wealth of the pulp and paper industry is the result of the work of the TAPPI Committee on Abstracts and Bibliography. Each year TAPPI publishes a volume entitled Bibliography of Paper Making and U. S. Patent List.

More than one hundred testing methods, recommended practices, and specifications have been adopted by the association and are known as TAPPI Standards. These standards have attained a high prestige in industry and commerce and are considered to be the basic authority on the subjects covered.

An important part of the association's activity resulted from its rapid growth and brought about the need for local sections. There are seven official TAPPI Local Sections located in major pulp- and papermaking regions.

TAPPI Special Reports are based on data obtained in surveys on manufacturing, management, engineering, and other types of problems. Over 300 reports have been issued to individual members who cooperated in the surveys and to the Corporate Members.

A new service of the Technical Association to its members was commenced in 1939 in the issuance of TAPPI Data Sheets in loose-leaf form. Engineering handbooks do not contain much engineering, chemical, or other data primarily applicable to the pulp and paper industry. TAPPI Data Sheets provide the means to fill the voids in ordinary handbooks. This service further reflects the invaluable part the Technical Association plays in the interests of the pulp and paper industry as a whole and in particular to all TAPPI Members, both company and individual. About 70 pages of data will be sent free to TAPPI Members in December, 1940.

Vocational training was a subject in which TAPPI took an active part by cooperating with the Federal Board for Vocational Education. The book which resulted from this study, Vocational Training for the Pulp and Paper Industry (Bulletin 168, Trade and Industrial Series 49) published in 1933, gives a job analysis with suggestions on the organization and operation of training programs.

A special committee of TAPPI called the Research Promotion Committee was appointed to select meritorious research projects for recommendation to the Executive Committee.

As a recognition for extraordinary achievements definitely contributing to the scientific and technical progress of the pulp and paper industry, the association has awarded nine gold medals since 1928. This award is known as the TAPPI Medal award.

The Technical Association contributed a substantial amount of money and many TAPPI Members contributed in the work of preparing a book entitled The Dictionary of Paper in cooperation with the American Paper and Pulp Association. The Technical Association contributed financially to the publishing of the book Color Charts for Fiber Stains. This book provides a complete set of color charts showing the colors of various stains when used on the various papermaking raw materials. This work was done in cooperation with the American Paper and Pulp Association and The Institute of Paper Chemistry.

The growth and progress of the Technical Association during its 25 years of existence has been phenomenal.

The officers of the Technical Association of the Pulp and Paper Industry from its inception to the present time follow:

Year	President	Present Company Connection	Vice President	Present Company Connection
1915–16	H. E. Fletcher	Fletcher Paper Co.	W. G. MacNaughton	News Print Service Bureau
1917*	W. G. MacNaughton	News Print Service Bureau	H. P. Carruth	Brown Company
1917	H. P. Carruth	Brown Company	W. G. MacNaughton	News Print Service Bureau
1918	H. P. Carruth	Brown Company	H. F. Obermanns	Hammermill Paper Co.
1919–20	R. S. Hatch	Weyerhaeuser Timber Co.	R. B. Wolf	Weyerhaeuser Timber Co.
1921–22	G. E. Williamson	Strathmore Paper Co.	F. C. Clark	Consulting Engineer
1923–24	H. S. Taylor	Consulting Engineer	G. N. Collins	Consulting Engineer
1925–26	G. K. Spence	Castanea Paper Co.	E. C. Tucker	Crocker McElwain Co.
1927–28	E. C. Tucker	Crocker-McElwain	P. H. Glatfelter	P. H. Glatfelter Co.
1929	P. H. Glatfelter	P. H. Glatfelter Co.	M. A. Krimmel	Hammermill Paper Co.
1930	M. A. Krimmel	Hammermill Paper Co.	R. H. Laftman	National Containers, Inc.
1931	M. A. Krimmel	Hammermill Paper Co.	Allen Abrams	Marathon Paper Mills Co.
1932–33	Allen Abrams	Marathon Paper Mills Co.	C. C. Heritage	Northwest Paper Co.
1934–35	C. C. Heritage	Northwest Paper Co.	G. N. Collins	Consulting Engineer
1936–37	G. N. Collins	Consulting Engineer	W. R. Maull	Mead Corp.
1938	F. C. Clark	Consulting Engineer	H. R. Murdock	Champion Paper & Fibre Co.
1939	F. C. Clark	Consulting Engineer	W. H. Swanson	Kimberly Clark Corp.
1940	W. H. Swanson	Kimberly Clark Corp.	R. A. Hayward	Kalamazoo Vegetable Parchment Co.

* W. G. MacNaughton was elected president in 1917, but he changed positions with H. P. Carruth who was elected vice president. Mr. MacNaughton went to the Inland Empire Company, Spokane, Washington, at that time.
T. J. Keenan served as secretary-treasurer of the association from 1915 to 1921, W. G. MacNaughton served from 1922 to 1927, and R. G. Macdonald has served from 1927 to the present time.

American Paper and Pulp Association And Affiliated Organizations

THE list of officers of the American Paper and Pulp Association and its affiliated organizations is presented herewith. The A. P. and P. A., which was formed at Saratoga Springs, N. Y., in 1878, is not only one of the oldest trade organizations in any field, but its accomplishments in the pulp and paper field also entitle it to high ranking. In the lists which follow, it has not been possible to give addresses, but these can be obtained in the new edition of Lockwood's Directory of the Paper and Allied Trades which is now on the press and which will be issued shortly.

American Paper and Pulp Association

President, J. L. Riegel, Riegel Paper Corporation. Vice-Presidents: D. K. Brown, Neehan Paper Company; Hugh J. Chisholm, Oxford Paper Company; R. J. Cullen, International Paper Company; D. C. Everest, Marathon Paper Mills Company; R. K. Ferguson, St. Regis Paper Company; Ralph A. Hayward, Kalamazoo Vegetable Parchment Company; W. B. Merlin, Hollingsworth & Whitney Company; John R. Miller, West Virginia Pulp and Paper Company; W. I. Osborne, Jr., Cornell Wood Products Company; Cola G. Parker, Kimberly-Clark Corporation; Norman W. Wilson, Hammermill Paper Company; Vertrees Young, Gaylord Container Corporation, and J. D. Zellerbach, Crown Zellerbach Corp.

Executive Secretary, E. W. Tinker.

The following are divisional associations of the American Paper and Pulp Association:

Blotting Paper Manufacturers Association

President, Henry S. Mead, Wrenn Paper Company.

Vice-President, U. S. Bratton, Jr., Rochester Paper Company.

Secretary-Treasurer, James L. Ritchie.

Book Paper Manufacturers Association

Treasurer, P. H. Glatfelter, P. H. Glatfelter Company.

Secretary and Assistant Treasurer, C. L. Barnum.

Bristol Board Manufacturers Group

Chairman, James B. Ramage, Franklin Paper Company.

Vice-Chairman, Joseph E. Holmes, Chemical Paper Manufacturing Company.

Secretary-Treasurer, James L. Ritchie.

Executive Committee: Norman Harrower, Linton Brothers & Co.; Joseph E. Holmes, Chemical Paper Manufacturing Company; James F. Ryland, Standard Paper Manufacturing Company; R. I. Worrell, Wheelwright Papers, Inc.; James B. Ramage, Franklin Paper Company; Kendall Wyman, Champion Paper and Fibre Company; Edward Bailey, Hollingsworth & Whitney Company; B. C. Hopper, Hopper Paper Company, and Carlton W. Smith, Miamisburg Paper Company.

Cardboard Manufacturers Association

President, Malcolm B. Lowe, Lowe Paper Company.

Vice-President, F. C. Heinritz, Appleton Coated Paper Company.

Secretary-Treasurer, James L. Ritchie.

Executive Committee: Herman Harrigan, District of Columbia Paper Mills, Inc.; Joseph A. Moses, Falulah Paper Company; F. C. Heinritz, Appleton Coated Paper Company, and Malcolm B. Lowe, Lowe Paper Company.

Fibre Board Manufacturers Association

President, C. F. Jameson, Milton Leatherboard Company.

Secretary-Treasurer, Campbell Bosson.

Executive Committee: E. H. Norton, C. H. Norton Company; John L. Norton, F. E. Norton Sons, Inc.; Ernest C. Blackwell, Spaulding Fibre Company, and C. F. Jameson, Milton Leatherboard Company.

Glassine and Greaseproof Manufacturers Association

Executive Committee: Chairman, Folke Becker, Rhinelander Paper Company; Olaf Hedstrom; Paul E. Hodgdon; Harry B. Kuhns; Paul F. Moore; Robert F. Nelson, and John L. Riegel.

Secretary-Treasurer, Thomas J. Burke.

Groundwood Paper Manufacturers Association

President, E. G. Murray, St. Regis Paper Company.

Executive Vice-President, R. E. Canfield, Wise, Corlett & Canfield.

Vice-Presidents, W. C. Shorter, International Paper Company, and C. K. Andrews, Blandin Paper Company.

Secretary-Treasurer, E. O. Merchant.

Board of Governors: E. G. Murray, Walter C. Shorter, C. K. Andrews, Aubrey Crabtree and W. A. Munro.

Kraft Paper Association

President, N. S. Stone, Mosinee Paper Mills Company.

Vice-President, E. R. Gray, St. Regis Paper Company.

Secretary-Treasurer, S. M. Hudson.

Paper Shipping Sack Manufacturers' Association

President, W. J. Dixon.

Vice-President, F. G. Bemis.

Executive Secretary, Frank Pocta.

SODA PULP MANUFACTURERS ASSOCIATION

Chairman, Eustis Paine, New York & Pennsylvania Company.

Vice-Chairman, Amor Hollingsworth, Penobscot Chemical Fibre Company.

Secretary-Treasurer, Rufus I. Worrell, Mead Sales Company.

SPECIALTY PAPER AND BOARD AFFILIATES

President, Paul R. Bachman, Riegel Paper Corporation.

Vice-President, Harry S. Lewis, J. P. Lewis Company.

Secretary-Treasurer, G. D. Cook.

Executive Committee: Paul R. Bachman; Harry S. Lewis; W. B. Sheehan, Missisquoi Corporation; S. B. Sutphin, Beveridge Paper Company; L. E. Vose, Hollingsworth & Vose Company.

SULPHITE PAPER MANUFACTURERS ASSOCIATION

General Chairman, LeRoy F. Porter, Northwest Paper Company.

Vice-Chairman Bleached Group, Fred W. Cole.

Vice-Chairman Unbleached Group, George Stuhr.

Vice-Chairman Manilas Group, Rufus L. Sisson, Jr.

Vice-Chairman Machined Glazed Group, Edgar W. Kiefer.

Board of Governors: John E. Alexander; Martin A. Brown; Walter B. Merlin; Harold O. Nichols; John Stevens, Jr.; Rufus I. Worrell; and Officers.

Secretary-Treasurer, Thomas J. Burke.

TISSUE ASSOCIATION

President, J. M. Conway, Hoberg Paper Mills.

Vice-President, Dwight G. W. Hollister, APW Paper Company.

Treasurer: Sam Wishnick, Park Tissue Mills, Inc.

Board of Governors: B. F. Picola, Gotham Tissue Corporation; R. B. Stevens, Stevens & Thompson Paper Company; B. I. Reider, Victoria Paper Mills; Sam Lopin, Hudson Pulp and Paper Corporation; W. Servotte, Bay West Paper Company; J. L. Ober, Scott Paper Company; R. W. Sweet, Sweet Brothers Paper Company; W. E. McIntyre, McIntyre Brothers Paper Company; H. Larsen, Crystal Tissue Company; W. Shafer, Jr., Flower City Tissue Mills, and E. W. Kiefer, Port Huron Sulphite Paper Company, and the officers.

Executive Secretary, Ross A. Fife.

U. S. PULP PRODUCERS ASSOCIATION

Executive Director, Oliver M. Porter.

WRITING PAPER MANUFACTURERS ASSOCIATION

President, A. C. Gilbert, Gilbert Paper Company.

Vice-Presidents, J. D. Zink, Strathmore Paper Company, and H. H. Hanson, W. C. Hamilton & Sons.

Executive Secretary and Treasurer, M. C. Dobrow.

Executive Committee: Chairman, A. C. Gilbert, Gilbert Paper Company; H. R. Baldwin, Hammermill Paper Company; M. D. Bardeen, Lee Paper Company; G. H. Beckett, Beckett Paper Company; D. D. Coffin, C. H. Dexter & Sons; Bruce Crane, Crane & Co., Inc.; G. B. Fowler, Valley Paper Company; W. J. Garrity, Munising Paper Company; T. A. Hendry, Mead Corporation; G. P. Lee, Parker-Young Company; R. S. Madden, American Writing Paper Corporation; E. A. Oberweiser, Fox River Paper Corporation; F. H. Savage, International Paper Company; W. B. Zimmerman, Maxwell Paper Company; J. D. Zink, Strathmore Paper Company, and H. H. Hanson, W. C. Hamilton & Sons.

Associate Members

The following are associate members:

AMERICAN WAXED PAPER ASSOCIATION

Executive Secretary, George J. Lincoln, Jr.

GLAZED AND FANCY PAPER ASSOCIATION

President, Harry B. Conklin, Louis Dejonge & Co.

Vice-Presidents, Leo R. McDevitt, Blackstone Glazed Paper Company and George J. E. Buell, Charles W. Williams & Co., Inc.

Executive Director, Arthur A. Thomas.

Executive Committee: Harry B. Conklin; Leo R. McDevitt; George J. E. Buell; Alfred C. Anders, Bradner Smith & Co.; John Hazen, Hazen Paper Company; Francis C. Heywood, The Marvellum Company and Charles Matthias, Matthias Paper Corporation.

Affiliate Members

The following are affiliate members:

AMERICAN PULP AND PAPER MILLS SUPERINTENDENTS ASSOCIATION, INC.

President, Arthur B. C. Drew, Somerset Pulp and Paper Company.

1st Vice-President, Oscar Stamets, Riegel Paper Corporation.

2nd Vice-President, Grover Keeth, Marathon Paper Mills Company.

3rd Vice-President, Lester S. McCurdy, National Paper Products Company.

4th Vice-President, Stanford C. Blankinship.

5th Vice-President, Ray L. Barton, Michigan Paper Company.

Finance Committee: Fred C. Boyce; William H. Brydges, Bedford Pulp and Paper Company and Killey E. Terry, S. D. Warren Company.

Secretary-Treasurer, Robert L. Eminger.

Field Secretary, George W. Craigie.

PULP AND PAPER TRAFFIC LEAGUE

President, F. E. Hufford, Castenea Paper Company.

Vice-President, T. H. Weatherdon, J. R. Booth, Ltd.

Secretary-Treasurer, H. R. Paul, Masonite Corporation.

Directors: F. F. Kator, Mead Corporation; W. J. Bailey, West Virginia Pulp and Paper Company; J. O. McKerrow, Abitibi Power and Paper Company, Ltd.; J. E. Bryan, Wisconsin Paper and Pulp

Manufacturers Traffic Association; A. A. Raphael, New England Pulp and Paper Traffic Association; C. E. Jones, International Paper Company; O. J. McSwain, Albemarle Paper Manufacturing Company; R. J. Henderson, Minnesota & Ontario Paper Company and H. Ignatius, International Paper Co.

SALESMEN'S ASSOCIATION OF THE PAPER INDUSTRY

President, J. R. Diggs, Mosinee Paper Mills Co.

Vice-President, (Chicago) C. H. Reeves, Allied Paper Mills.

Assistant Vice-President, (Chicago) B. B. Fisher, Bergstrom Paper Company.

Vice-President, (New York) J. D. Johnston, Gaylord Container Corporation.

Assistant Vice-President, (New York) H. A. Stone, Jr., Riegel Paper Corporation.

Secretary-Treasurer, Dr. E. O. Merchant.

Executive Committee: J. R. Diggs, G. K. Gibson, A. J. Ericsson, J. D. Johnston, L. H. Sisson, H. A. Stone, Jr., C. H. Reeves, B. B. Fisher, A. B. Helffrich and E. W. Tinker.

Advisory Board: G. K. Gibson, J. L. Fearing, J. H. Coy, S. C. Knode, H. R. Knott, W. L. Raymond, C. W. Whiting, E. R. Lyman, R. C. Johnson, J. T. Burruss and H. N. Phillips.

Membership Committee: National Chairman, G. K. Gibson, Mosinee Paper Mills; Western Chairman, F. X. Meiners, Filer Fibre Company; Eastern Chairman, E. F. Miles, Crocker-McElwain Company.

Educational Committee: National Chairman, A. J. Ericsson, Riegel Paper Corporation; Eastern Chairman, S. O. Styles, Martine Cantine Company; Western Chairman, J. T. Burruss, Albemarle Paper Manufacturing Company.

Social Committee: National Chairman, A. B. Helffrich, St. Regis Paper Company; Western Chairman, B. K. Babbitt, Brown Company; Eastern Chairman, Louis Chable, Jr.

Miami Valley Committee: Chairman, L. H. Sisson, Racquette River Paper Company.

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY

President, W. H. Swanson, Kimberly-Clark Corporation.

Vice-President, R. A. Hayward, Kalamazoo Vegetable Parchment Company.

Secretary-Treasurer, R. G. Macdonald.

Executive Committee: W. H. Swanson; R. A. Hayward; R. G. Macdonald; L. C. Anderson, Ontario Paper Company, Ltd.; G. S. Brazeau, Weyerhaeuser Timber Company; G. W. E. Nicholson, Southern Kraft Corporation, B. M. Thomas, American Coating Mills; V. P. Edwardes, International Paper Company; F. D. Libby, Kalamazoo Vegetable Parchment Company; R. C. Griffin, Arthur D. Little, Inc.; H. H. Harrison, Crystal Tissue Company; Albert Bankus, Crown Zellerbach Corporation; G. Lamont Bidwell, Jr., Riegel Paper Corporation; M. P. Chaplin, Chaplin Corporation and J. L. Parsons, Hammermill Paper Company.

News Print Service Bureau

The News Print Service Bureau is an independent association. Its officers are as follows:

President, A. L. Hobson, St. Croix Paper Company.

Secretary-Treasurer, R. S. Kellogg.

Watermarks in Papers

Watermarks in paper are among the oldest brand or trade names and have been influential in establishing the practice of branding many other products with the identification marks and designs of the producers. The single word "company" watermarked in the paper manufactured by William Rittenhouse in his mill on Paper Mill Run rivulet, Germantown, Pa., in 1692, was the first watermark used in the American Colonies. Later on this pioneer American paper maker used other designs for identifying his product. William Bradford, the first public printer, and a part owner in the Rittenhouse paper mill, printed nearly all of his publications on Rittenhouse papers. For more than a century the watermark of the Rittenhouse mill remained a clover leaf.

Benjamin Franklin's private watermark included the "fleur de lis" and appeared in the paper used in printing Poor Richard's Almanac in 1748. This paper, however, was produced in 1747 at the Anthony Newhouse paper mills on Trout Run, Miquon, Pa., and was watermarked "Pro Patria."

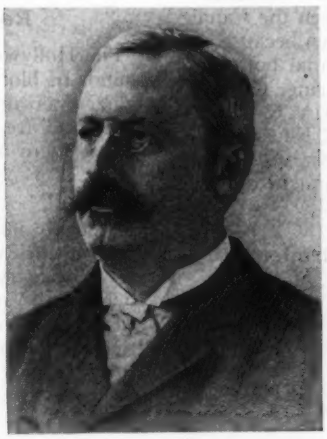
Research conducted by James F. Magee, Jr., of Philadelphia, well known watermark expert, reveals that between the year 1690 and the Revolutionary War, twenty-five paper mills were erected in southeastern Pennsylvania.

To these few early watermarks a long list of watermarks and brands have been added down the years. In the current edition of "Lockwood's Directory of the Paper and Allied Trades" a comprehensive list of over 15,000 representative trade marks and brands are given.

Paper Trade Journal

The PAPER TRADE JOURNAL was established at 14 Park Place, New York City, May 27, 1872, by Howard Lockwood. The first editor was Charles F. Wingate, who served in that capacity until July 15, 1875. The paper was first issued as a semi-monthly on the 1st and 15th of the month, but was changed to a weekly with the first issue in 1876.

On the first page, which was 18¼ x 23¾ inches, of the first issue, was printed the more important news and other matter including an article on the "Tariff on Paper, Books, &c." "The Sanitary Authorities and Importation of Rags," Manufacturing News, Incorporations, etc. On the second or editorial page, in addition to the editorial matter, appeared a prospectus by Howard Lockwood explaining the needs of a trade journal in the paper field and outlining the purposes of the PAPER TRADE JOURNAL.



HOWARD LOCKWOOD

The price of the paper was ten cents per copy which price has always been maintained. The JOURNAL filled a need and it prospered from the start. It was encouraged by the members of the industry both in the way of subscriptions and advertisements.

From 14 Park Place, the office was removed to 36 Beekman street, then directly in the heart of the paper district, but the growth of the business soon caused a removal to 74 Duane street. In 1883 larger quarters were again sought at 126-128 Duane street and cramped quarters necessarily led to the removal in 1895 to the corner of Bleecker street and West Broadway. Howard Lockwood died November 4, 1892, and the business was carried on by his widow under the style of the Lockwood Publishing Company. She became president and was later married to C. Alers-Hankey who became treasurer of the company and Colin K. Urquhart became secretary and managing director and editor.

The paper was purchased in 1899 by Colonel C. H. Jones who moved the business to 150 Nassau street and continued the business under the style of the Lockwood Trade Journal Company. Colonel Jones was prominent in national politics and was one of the best trained newspaper men in the country. He had for some time been associated with Joseph Pulitzer in the publication of the New York World, of which he was managing editor. He was induced by Mr. Pulitzer to go to St. Louis to become editor and general manager of the Post-Dispatch, which position he held until 1896. When he bought the PAPER TRADE JOURNAL in the Spring of 1899, he made his brother, George W. Jones, manager, although he gave the journal much personal attention at first and continued as careful supervision as his health would permit until his death in 1913.

In 1916 Henry J. Berger became editor of PAPER TRADE JOURNAL.

After the death of Colonel Jones, all of the common stock in the Lockwood Trade Journal Company, representing a one half interest, was acquired by Leslie R. Palmer, a banker and lawyer. The Jones estate retained the other half interest in the business.

Mr. Palmer moved the offices to 10 East 39th street to accommodate the growing business. While the paper prospered under his management, Mr. Palmer preferred to confine himself more completely to banking and real estate, in which he was a large operator, and this influenced him in February, 1923, to dispose of his interest in the business to George S. Macdonald, who became vice-president and treasurer.

Mr. Macdonald, a widely experienced publisher, took a deep interest in the publication which soon manifested itself in many improvements, although he has always assiduously avoided making any revolutionary changes which would radically alter the character of the paper.

In February of 1925 the technical publication called *Paper* was acquired and consolidated with the PAPER TRADE JOURNAL. In July, 1928, Mr. Macdonald acquired by purchase the half interest in the property held by the Jones Estate and became president of the Lockwood Trade Journal Company. In 1932 the paper was moved to the present offices at 15 West 47th street.

The officers of the company are: George S. Macdonald, president; Arthur E. Gordon, executive vice-president; Joseph P. Horgan, secretary; George E. Lockwood, treasurer.

The editors of PAPER TRADE JOURNAL are Henry J. Berger, editor, and Stillman Taylor, associate editor.

Lockwood's Directory of the Paper and Allied Trades was started in 1873 to supplement the work of the PAPER TRADE JOURNAL. The first two volumes were issued biannually, but since 1876 the Directory has been issued annually until the present time. The first volume contained 212 pages as compared to 1298 in the present 1941 issue.

The directory has not only grown constantly in size during the years from the first edition until now, but has also constantly increased the service which it has rendered the industry.

C. K. URQUHART | H. J. BERGER | MRS. C. ALLERS-HANKEY | C. H. JONES | L. R. PALMER | G. S. MACDONALD

Albemarle Paper Manufacturing Co.
Richmond, Va.

In 1887, A. B. Thaw interested Richmond capital in starting a paper mill, and organized a company under the name of the Albemarle Paper Manufacturing Company. A mill was built between the Canal and the James River. This site was chosen because of the fine water supply offered by the Canal both for water power and for use in manufacturing. Captain J. S. Chalmers was elected president and A. B. Thaw, secretary and manager. In 1907, H. W. Ellerson, its present president, was called to take charge of the company and it has greatly expanded and prospered under his management.

Equipped With 88 inch Fourdrinier

The mill was known as Hollywood Mill and was equipped with an 88 inch Fourdrinier machine for the making of newsprint and manila papers. However, in 1888, production was switched over to Blotting, Matrix, Filter, and other absorptive papers, and the necessary additional equipment added.

Only One Day Shift Required

Only one day shift was employed because it was not believed that the best paper could be made by artificial light, nor was it necessary to meet the demand. However, in 1908, when the mill was shut down for repairs and got behind in shipments, overtime was necessary and it was proved that night running could be done successfully. A year or two later with the beginning of the era of wide expansion and great competition in business, bringing with it great activity in advertising, there was a large increase in demand for blotting paper and the mill began continuous twenty-four hour operation.

Recognized As Among Best

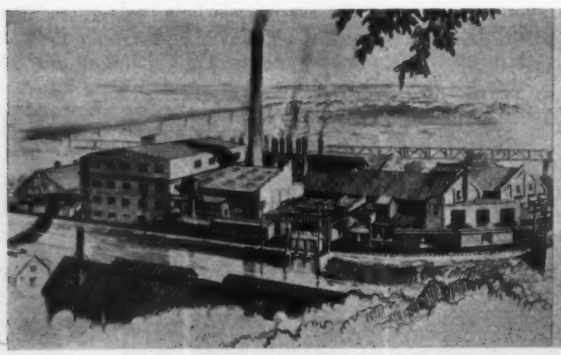
The Hollywood Mill now has a capacity of 45,000 pounds of blotting paper per day. Its papers are recognized as among the best made anywhere in the world and are shipped to every state in the Union as well as many foreign countries.

Picturesque Setting

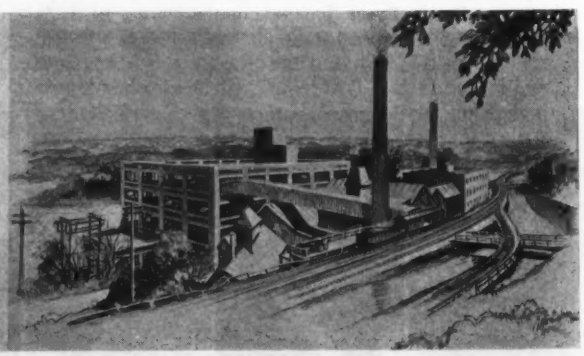
Probably no mill in America has a more picturesquely historical setting than the Hollywood Mill of the Albermarle Paper Manufacturing Company of Richmond, Virginia. It is situated on the banks of the James River between the river and the old James River and Kanawha Canal. George Washington took an active part in the engineering of this Canal and was president of the company that built and operated it.

Great Expansion

Since its early beginning the company has expanded a great deal. Since 1919 it has owned and operated another mill in Richmond known as Brown's Island, in which it makes about 110 tons of kraft paper per day. In 1937 it bought the Halifax Paper Company at Roanoke Rapids, N. C., and it makes in this plant an additional 35 tons of kraft paper per day as well as the majority of the kraft pulp necessary for its Brown's Island Mill.



BROWN'S ISLAND MILL



ALBEMARLE PAPER MFG. CO. HOLLYWOOD AND RIVERSIDE MILLS

The Beckett Paper Co., Hamilton, Ohio

The Beckett Paper Company was established in 1848 at Hamilton, Ohio. It is the oldest industry in Hamilton and is believed to be the oldest paper mill west of the Allegheny Mountains. The founders were Calvin Reilly, an investor, of Toledo, Ohio, and Adam Laurie, a young paper maker from Glasgow, Scotland. At that time, Hamilton was a village of 2,000 population and Cincinnati, with its 100,000 population, was the foremost city of the West. Calvin Reilly came to Hamilton in search of a place for investment. There was no railroad, but the Miami and Erie canal provided transportation and there was hydraulic power. These facilities had already attracted cotton, woolen and saw mills, and influenced Mr. Reilly to purchase lands on which the Beckett Paper Company has ever since been located, and contracted for water power.

The situation seemed favorable for paper making. There was an abundance of pure water and the great market of Cincinnati was at hand. Mr. Reilly knew nothing of the manufacture of paper, but he was able to employ as his superintendent Adam Laurie, a practical paper maker who also possessed considerable business ability. Under the terms of his employment, Mr. Laurie was to supervise the construction of the mill and operate it when completed. But before the work had progressed beyond the foundations, Mr. Reilly failed and left Mr. Laurie stranded.

THE BECKETT PAPER CO., HAMILTON, OHIO, 1940

In this emergency Adam Laurie turned to William Beckett, a young lawyer who had begun to speculate in Hamilton real estate, particularly in industrial sites with hydraulic power facilities. Mr. Laurie had prepared a prospectus showing that the proposed paper mill could be built complete for $12,000. The daily cost of operation was estimated at $155.63. It was proposed to make 2,000 pounds of printing paper daily, valued at $182.50. On an operating schedule of 280 days a year an aggregate net profit of $5,027.60 was anticipated, or earnings of $17.92 for each working day. These representations interested William Beckett and he gave up his law practice for the paper business and various other promotional activities. The mill was completed at a cost of $12,000 and has been operated on the same site and under the same family control for over 92 years.

At the death of William Beckett, his son, William, took charge of the mill. It prospered and the Beckett Paper Company made the paper for the majority of the 122,000,000 McGuffy Readers printed before 1901. At the outbreak of the Civil War in 1861, William Beckett entered into a contract with the Cincinnati *Commercial Gazette* to furnish all the printing paper that newspaper required. This was estimated to represent about one-fourth of the capacity of the mill. At the start of the conflict, the circulation of the *Commercial Gazette* increased greatly and at the same time the cost of rags doubled and trebled until rags finally reached a price of nine and one-half cents per pound, which was the exact price paid for the finished paper.

Efforts were made to secure release from the disastrous contract without success, when the resourcefulness of Adam Laurie conceived the plan of de-inking and pulping old newspapers as basic stock. This proved acceptable to the customer and the Beckett business was kept solvent. The de-inking process used was not perfected as it is today and sometimes a word or two from the old stock would appear in the morning newspaper. This led the proprietor of the *Commercial Gazette* to write to the Beckett mill that he was glad to get the paper, but preferred to do his own printing.

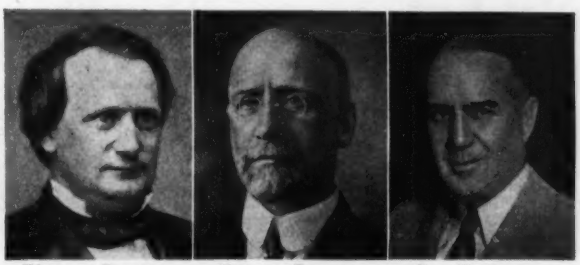
Thomas Beckett, the real founder of the Becketts of today, came into the business in 1876 at the age of sixteen years. He worked in every department of the mill to familiarize himself with the entire business and resolved to modernize the plant and to seek wider markets. Gradually the management passed into his hands and he proved competent. Before 1890 he had torn down, rebuilt and reequipped the entire establishment.

One of the important contributions of Thomas Beckett was the creation of Buckeye Cover about the year 1894. Prior to that date S. & S.C. cover, such as was used on every almanac and railroad circular, was the only cover available. Working in cooperation with the late James White, the Chicago paper merchant, Thomas Beckett conceived and developed a line of color antique cover papers of superior strength and appearance. This was one of the earliest cover papers and has had many imitators. In its enlarged and modernized form Buckeye cover papers continue to form the best known Beckett line.

Until the World Conflict the Beckett Company made immense quantities of writing and bond papers, largely under the private brands of paper merchants. Changing conditions led to the development of a program of proprietary lines covering the principal needs of the printing trade. In the order of their development these lines include Buckeye Text, Beckett Cover, Beckett Text, Beckett Offset, Ohio Cover, Tweed Text, Beckett Brilliant White Opaque. In addition, many special greeting and announcement lines are made, together with a variety of envelope and other special papers. The regular Beckett lines now include cover papers in three grades, text papers in three grades and offset papers in a great variety of weights, finishes and colors.

The advertising of Beckett papers began about 1908.

The present officers of the company are: chairman of the board, B. R. Millikin; president, M. M. Beckett; vice-president, Guy H. Beckett; treasurer, William Beckett; secretary, C. R. Greer. These officers, together with Dan Beckett, Don W. Fitton and Valentine Friedrich, Jr., constitute the board of directors.



WILLIAM BECKETT THOMAS BECKETT GUY H. BECKETT

Brightwater Paper Co.
Adams, Mass

The history of this company as a paper manufacturer began in 1904 under the name of the Berkshire Hills Paper Company. The mill continued to manufacture under this management until 1928. In April of that year the mill was purchased by the Eaton Paper Company, a new corporation owned and operated by the Eaton, Crane & Pike Company and Henry J. Guild, who had long been connected with the paper industry. Under Mr. Guild's supervision as General Manager, $500,000 was expended on additions and improvements to the plant, developing a modern and efficient mill.

HENRY J. GUILD

Changed Hands in 1933

In 1933 the plant again changed hands when it was purchased and organized as the Brightwater Paper Company, the principal owners being Henry J. Guild and Robert R. Young, who in 1937 also bought into and became Chairman of the Board of the Alleghany Corporation. Mr. Guild became President and General Manager and Mr. Young became a director in which capacity he continues to maintain an active part in the management of the company.

At Peak of Efficiency

In its new regime under Mr. Guild's presidency, the Brightwater Paper Company was brought to its full peak of efficiency; further expenditure being made annually for purposes of modernization, efficiency, and improved quality of the product. In 1939 more than $140,000 was spent in new plant facilities. The mill, up to date now in every way, makes a special point of the purity of its Artesian Well Water which, of course, is reflected in the brilliancy of its paper.

The Brightwater Line

The Brightwater Paper Company makes machine dried, air dried and pole dried papers, embracing rag and sulphite bonds, rag and sulphite ledgers, weddings, bristols, papeteries, impregnating papers and other specialties. One of its specialty lines is Brightwater Delible Bond, the original easy erasing paper. This is a patented paper on which typewritten matter can be erased cleanly and quickly without destroying the surface.

The Officers

The present officers are:

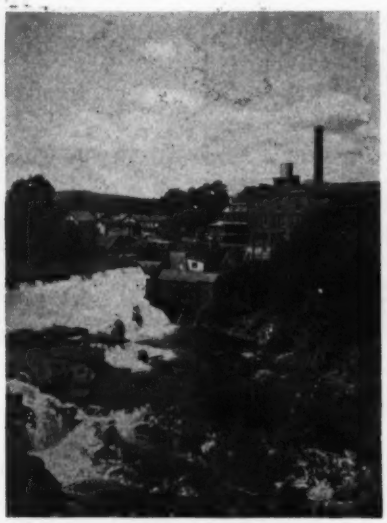
Henry J. Guild, president.
George W. Verow, vice president.
Harold M. Rice, treasurer.
Frank D. White, secretary.
Dorothy H. Rice, assistant secretary.
Leon E. Maglathlin, sales manager.

BRIGHTWATER PAPER CO.

Martin Cantine Co., Saugerties, N. Y.

The Martin Cantine Company was established in 1888 at Saugerties, N. Y. The founder, Martin Cantine, began his business career at the age of fifteen carrying mail for the old Sheffield Company of Saugerties, famous manufacturers of blank books. Before he was eighteen Martin Cantine had become Sheffield's star salesmen of paper, books and printing. The field appeared most attractive to him. Martin Cantine had seen the tendency to blur in printed reproductions of halftones and he knew the fine screen halftones of that period were not practical because the ink seemed to spread. He reasoned that this defect could not be due entirely to the ink, but must largely be a paper problem. His fertile mind suggested a remedy. Why not apply some white film to the surface of the paper which would provide a better base for printing and so overcome the limitations of halftone printing?

The old Adams Card Company, of Albany, N. Y. was using a coating process for the production of lithographed playing cards. Martin Cantine visited the Adams plant and found that the mill was coating cardboard with clay, using hand labor and brushing on the coating on sheets as large as 14 by 28 inches. Hand work was too slow a method for Martin Cantine but the process was good. Before long Mr. Cantine purchased the Adams Card Company and proceeded to put his ideas into practice. He erected a mill on the high rocky land north of the Esopus, near the Saugerties bridge. The best workmen were brought from Albany. Henry Dickhaut was hired as superintendent and by the end of 1888 Martin Cantine's mill was producing two tons of coated paper daily.



PLANT OF THE MARTIN CANTINE CO.

Martin Cantine was a man who made friends easily and kept them. He possessed the assets of integrity and consideration for others in his business transactions. He quickly won the confidence of paper merchants and printers of his time, and never lost it. The paper produced by the Martin Cantine Company not only met existing needs but also opened up new fields for printers and advertisers.

To Holly R. Cantine, the present head of the company, personal credit is due for the broadening and improvements in the business that began in 1919. He started working at the mill in 1905, when he was 14 years old, during summer vacations from school. Subsequent vacations were spent in one department after another and gradually he learned to do the work of any man in the clay and color rooms, the coating room, the finishing room down to the shipping department. Then came a thorough grounding in the office, the study of accounts, credits, correspondence, investments, purchases and sales. Thus Holley R. Cantine mastered every detail of the business. With all this he learned how to balance work with recreation. The impressive new Cantine Memorial Athletic Field of which Saugerties is justly proud, is an expression of Holley Cantine's conviction that, for everyone, life is meant to be enjoyed.

The foundation work of Martin Cantine has been solidly laid but it was for Holley R. Cantine to develop and improve the business. By 1920 he saw that the world had changed. Up to that time The Martin Cantine Company had been a manufacturing organization. Most of the papers were private-branded and consumers rarely knew what paper they were using. It required time for a printer to check up all possible sources of supply. So, Holley Cantine planned how to introduce this improvement. In 1922 he was made general manager and put the plans into effect. Mill brand names were established, some papers were discontinued and others added to meet the growing needs of the graphic arts.

From the start, Henry Dickhaut proved a superintendent of unusual ability. There were no precedents to follow and he devised one improvement after another until the mill reached top efficiency and its products top quality. Henry Dickhauts abilities were passed on to his son, Stephen, who joined the company ten years later and stayed until his retirement on pension, and to his grandson, Henry, who is carrying on his forbears' work today. Sales matters were delegated to William R. Crump, who with Messrs. Cantine, Dickhout and Dedrick, comprised the "Big Four" of the original Cantine directorate. Mr. Crump from his office in New York became one of the large contributors to the success of the business. From the younger men of the organization, he selected as his aide, Stanley O. Styles. After Mr. Crump's death Philip C. Batzle became the aide of Mr. Styles. "Stan" and "Phil" have been in joint charge of the New York sales office for twelve years. Norman Kimball in the East, Edmund Skinner in the West and James J. Forsythe in Chicago, have made sales records by following the principles established by Mr. Crump.

James Dedrick, assumed charge in the office in January of the first year and became secretary when the company was incorporated. Lew Fellows entered the company as office boy in 1906. He became secretary when Mr. Dedrick became treasurer and treasurer in 1922 when Mr. Dedrick retired. Fred Fonda, assistant secretary since 1916, followed through and became secretary of the company when Mr. Fellows, now in the prime of life, was elected to the office of treasurer.

The present officers of the company are: Holley R. Cantine, president; Lewis F. Fellows, treasurer; Fred Fonda, secretary.

MARTIN CANTINE — HOLLEY R. CANTINE — LEWIS F. FELLOWS — FRED FONDA

The Chesapeake Corp., West Point, Va.

The Chesapeake Corp. was established in 1913 at West Point, Va. A group of men from Cincinnati, Ohio, interested in banking and papermaking, after investigating many sites with a view of erecting a sulphate pulp mill, decided to locate at West Point, in King William County, Virginia. The Chesapeake Pulp and Paper Company was organized, and a mill was built on the Pamunkey River, about a mile from where this river joins the Mattaponi to form the York and approximately 39 miles east of Richmond.

The mill began operations on May 16, 1914, with a capacity of about 15 tons of pulp a day. In 1917 a cylinder board machine was added to the plant, and by 1918 the maximum capacity of the pulp mill was increased to approximately 23 tons daily. In November, 1918, a group of industrialists took over the Chesapeake Pulp and Paper Company, and reorganized it under the name of the Chesapeake Corporation.

Fairchild Aerial Surveys Inc.

CHESAPEAKE CORP.

The management of the mill was placed by the new owners under the supervision of Elis Olsson, who has been identified with the sulphate industry practically as long as it has existed on this continent. It is only natural that a man so closely connected with the industry should have an opportunity to obtain a high grade staff to work with him, and that has been the case. Under the management of Mr. Olsson, the production of the mill was increased. By 1921 it was producing approximately 33 tons of board and 46 tons of pulp per day.

The purchases and sales were placed in the hands of W. C. Gouldman, secretary of the company, who had been closely connected with the Chesapeake Pulp and Paper Company's sales organization since its beginning.

There were some changes in the official personnel of the company between 1918 and 1921, as the controlling block of stock in the company changed hands several times, but Mr. Olsson remained general manager and Mr. Gouldman secretary and sales manager, and each of them continued to be a member of the board of directors.

In 1921, the Albemarle Paper Manufacturing Company of Richmond, Va., was the largest purchaser of pulp from the Chesapeake Corporation. Some gentlemen connected with that company decided to buy the controlling interest of the Chesapeake Corporation, and Mr. Olsson was then elected vice-president as well as general manager. H. W. Ellerson, president of the Albemarle Paper Manufacturing Company, became president of the Chesapeake Corporation, and J. Scott Parrish of Richmond, a director of the Albemarle Paper Manufacturing Company, became treasurer of the Chesapeake Corporation. Mr. Gouldman remained as secretary. As directors of the company, besides the above named officers, T. Croxton Gordon and Julien H. Hill of Richmond and W. H. Hotchkiss of New York, who was president of the Chesapeake Corporation at the time the Richmond men purchased the controlling interest, were elected. Mr. Hotchkiss resigned in 1922, and the affairs of the corporation were thence directed by the six remaining gentlemen.

The beginning of the great expansion in the sulphate industry in the southern states of the United States, as well as in Sweden and Finland, caused Mr. Olsson some anxiety about the future of the industry. It looked as if, temporarily, at least, the competition would result in very low prices and certainly make it impossible for a pulp mill to survive, if it had to ship out practically all its pulp. It therefore seemed desirable that a finishing plant or paperboard mill should be erected adjacent to the pulp mill to convert the pulp into a finished product.

It also seemed fair that the Albemarle Paper Manufacturing Company, which had been the biggest consumer of the pulp, should share in the profits, if any, of such an undertaking, therefore, the Albemarle-Chesapeake Company, Inc., was formed in 1928, with the Albemarle Paper Manufacturing Company and the Chesapeake Corporation as owners of the new company, with the directors of the two companies serving on the board.

In December 1938 the Chesapeake Corporation bought out the interests of the Albemarle Paper Manufacturing Company in Albemarle-Chesapeake Company, Inc., and on August 10, 1940, Albemarle-Chesapeake Company, Inc., was consolidated by a merger into the Chesapeake Corporation.

The entire operation is now carried on by the Chesapeake Corporation, with officers as follows: Elis Olsson, president; H. W. Ellerson, vice-president; J. Scott Parrish, treasurer; W. C. Gouldman, secretary; Miss Elizabeth S. Gray, assistant secretary. There are seven members of the board of directors as follows: Elis Olsson, H. W. Ellerson, J. Scott Parrish, W. C. Gouldman, T. Croxton Gordon, Julien H. Hill and Overton D. Dennis.

W. C. GOULDMAN J. SCOTT PARRISH T. CROXTON GORDON ELIS OLSSON H. W. ELLERSON OVERTON D. DENNIS JULIEN H. HILL

Consolidated Water Power & Paper Co.

The Consolidated Water Power & Paper Company was organized under the laws of the State of Wisconsin July 28, 1894, under the corporate title "Consolidated Water Power Company" for the purpose of consolidating several small water powers on the Wisconsin River at Grand Rapids and Centralia (now Wisconsin Rapids). On November 10, 1902, the stockholders passed a resolution amending the articles of incorporation, broadening its purposes to include the manufacture of paper and changing the name to Consolidated Water Power & Paper Company.

The paper mill at Wisconsin Rapids was constructed in 1903 and 1904. The paper mill at Biron was acquired on September 5, 1911, from the Grand Rapids Pulp and Paper Company by giving stock in exchange for its assets and assuming its liabilities. These two mills purchased their requirements of sulphite pulp until November 1, 1916, at which time the Appleton sulphite mill was acquired through the purchase of the Interlake Pulp and Paper Company, which was later merged with the parent company.

On July 1, 1918, the Oneida Paper Company was organized as a subsidiary for the purpose of acquiring a water power site owned by the Jackson Milling Company at Stevens Point, and construction of the Stevens Point hydro-electric properties was started that year. On November 8, 1919, the name was changed to Oneida Power Company, and its purpose changed to a public utility. On April 1, 1926, this company acquired the hydro-electric properties at Wisconsin Rapids and Biron from the parent company and the corporate title was changed to Consolidated Water Power Company. The Stevens Point paper mill was constructed in 1919. Waxing, tissue, and creping papers were manufactured from sulphite pulp furnished by the Appleton mill. The first union agreement was entered into with the International Brotherhood of Paper Makers (American Federation of Labor) on May 17, 1919.

The Interlake Pulp and Paper Company owned stock in Newaygo Company, Ltd. and in Newaygo Tug Line, Inc., the former owning tracts of exportable spruce in the vicinity of Port Arthur, Ontario, and the latter, floating equipment for the transportation of pulpwood in rafts. Large quantities of spruce pulpwood were required in the operations of these mills and as the supply was diminishing in this section of the United States the balance of the stock of these two companies was purchased in 1920 in order to secure a portion of the spruce requirements from Canada. During the period from 1920 to 1923 the manufacturing facilities of Wisconsin Rapids and Biron mills were substantially increased. A sulphite mill at Wisconsin Rapids and new hydro-electric plants at Wisconsin Rapids and Biron were included in this expansion program. A large area of exportable spruce in the District of Algoma, Ontario, was purchased on April 10, 1924, from the Algoma Central and Hudson Bay Railway Company. This purchase was primarily for the purpose of assuring an adequate supply of spruce pulpwood for the Appleton mill. This tract is owned and operated by Newaygo Timber Company, Ltd.

Experiments were made in 1933 with a new and revolutionary process for coating paper on the paper machine during the process of manufacture. Formerly coating was applied to the finished paper in a separate operation. The controlling interests in the patents for this process were acquired December 3, 1933. A coating machine designed with the improvements resulting from experiments was built and installed on No. 4 machine at Wisconsin Rapids. This machine started producing coated paper in January 1935. This process was licensed to manufactures in foreign countries. In 1935 a coating machine was installed at Stevens Point which resulted in the successful development of coated waxing paper for bread wrapping. After these coated papers were perfected additional facilities were required to meet the demand for these papers. Additional coating machines were installed at all of the paper mills and a modern new paper machine equipped for this coating process was installed at Wisconsin Rapids mill. Other units were enlarged to meet the requirements of this increased capacity. This construction program is being completed in 1940.

George W. Mead, president and general manager of the company, has been a director and general manager since November 10, 1902. He supervised the construction of the original mill at Wisconsin Rapids, and has been the principal executive officer of the company through its many years of successful operation. Associated with George W. Mead in the management of this company are his two sons, Stanton W. Mead and Walter L. Mead. The former has been connected with this concern since 1922, has been a director since January 26, 1927, and holds the position of vice-president and treasurer, and director of manufacturing. Walter L. Mead has been with the company since 1926, and has been a director since January 26, 1927, and is now vice-president and director of sales. E. B. Redford, a former banker, became associated with the company in 1916, and has served as secretary and principal financial officer for many years. He has been a director since January 26, 1927. Theodore W. Braseau, an attorney, has been a director since January 21, 1920, and has acted as chief counsel for the corporation from the time it started operations.

Consolidated paper brands are stocked and distributed by over one hundred wholesale paper corporations located in important cities all over the nation.

Crane & Co., Dalton, Mass.

Crane & Co. was established by Zenas Crane who built the first mill at Dalton, Mass., in 1801 The original deed for the mill site was given by Martin Chamberlain to Henry Wiswall, Zenas Crane and Daniel Gilbert. The land was bought for $194. Members of the Crane family had been connected with three paper mills before the Dalton mill was erected. The first mill supplied currency paper for the American Colonies. The ledger of this mill, known as the Liberty Mill, shows entries of purchases of currency paper by Paul Revere who engraved currency for the colonies. Another early Crane mill was built by Stephen Crane, elder brother of Zenas Crane, at Newton Lower Falls. Zenas Crane learned the papermaking trade from his brother Stephen. He was superintendent of the Burbank Mill at Worcester, from 1799 to 1801, when he came to Dalton at the age of 21 in search of a site for a new mill.

W. Murray Crane

The mill was erected at Dalton as a one vat mill, and was on the site of what is now the Old Berkshire Mill. It consisted of two floors, the upper one being used as a drying loft. The mill had a daily capacity of twenty posts, a post consisting of 125 sheets of folio or cap size, making 100 to 125 pounds of paper. The employees included an engineer at $3 a week and a vatman and coucher at $3.50 a week. The layboy was paid 60 cents a week and board. The compensation of Zenas Crane a few years later as superintendent and general manager, was $9 a week. In 1809, another mill was built at Dalton on land owned by Martin Chamberlain, on the site of the present Pioneer Mill. On April 6, 1810, Zenas Crane bought a third interest in a new mill, which later was known as the Old Red Mill. In 1822, he became sole owner of it.

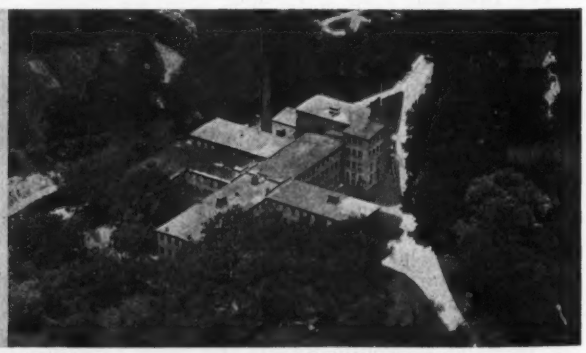
In 1831, a cylinder machine, made by James Ames of Springfield, was installed and in 1834 cylinder dryers were added. The date of the first Fourdrinier machine is not known but it was probably installed a few years later than 1840. Zenas Crane died in 1845, having in 1842 transferred the business to his sons, Zenas Marshall and James B., who continued the business as Crane & Company. A stone mill was built in 1844 near the then standing Old Red Mill, which was destroyed by fire in that year. In 1879, Crane & Company purchased the Colt Mill in Coltsville, in which bank note paper for United States currency was made. In 1893, a new brick mill was built to replace the old stone Pioneer Mill and several additions have since been added to it.

Zenas Marshall Crane is given credit for inventing an attachment to the Fourdrinier to regulate the even flow of pulp to obtain an even thickness of paper. The first mechanical layboy was also devised by him, as was the old, distinctive bank note paper, with parallel silk threads, which was first made in 1844 for a bank.

When Zenas Marshall Crane died in 1887, and James B. Crane in 1891, the business passed to Zenas Jr. Crane, Winthrop Murray Crane and Frederick G. Crane and subsequently to their sons and grandsons, who represent the fourth and fifth generations from Zenas Crane the pioneer paper maker.

The present officers of Crane & Company are: Winthrop M. Crane, Jr., president and general manager; Frederick G. Crane, vice-president; W. G O'Connell, treasurer, and R. C. Pierce, secretary.

Old Berkshire Mill



Crane & Co., Inc.

Bay State Mill

Crocker, Burbank & Co. Assn.

In 1826 Alvah Crocker bought a mill site in West Fitchburg and started the business since developed into the present Crocker, Burbank & Co. Assn. which operates eight mills with a daily output from eighteen machines of 350 tons of paper.

A fire which levelled Crocker's best mill in 1842 led to a partnership with Gardner S. Burbank and between 1842 and 1874 they acquired the Snow, Cascade, Upper, Hanna, Whitney, Lyon and Stone mills. In 1855 Mr. Crocker's son, Charles T. Crocker came into the firm. The Snow mill, taken over in 1862, was built in 1839 by S. S. Crocker and sold to Benjamin Snow, Jr., in 1847 and he, with Samuel Whitney, turned the mill over to Crocker Burbank after fifteen years of operation. The Cascade mill, bought in 1863, was built about 1842 and first owned by S. S. Wheeler, George Brown and Joel Davis and later by E. P. Tileston, Jonathan Ware and Franklin Wyman who, in turn, sold out to Crocker Burbank. The Upper mill, now known as the Brick mill, built in 1851 by Alvah Crocker and Edwin Upton came into the Crocker Burbank group in 1859. The Hanna mill, built in 1852 by George and Joseph Brown, passed into the hands of Samuel Hanna who disposed of it to Crocker Burbank in 1860. The Whitney mill in Rockville, twice bought by the firm, was built in 1847 by Whitney and Bogart who sold it to Crocker Burbank, later bought by Samuel Whitney and William Baldwin, Jr., and finally reacquired by Crocker Burbank in 1868. The Lyon mill, built in 1853 by Moses G. and B. F. Lyon, was sold to Crocker Burbank in 1869. The Stone mill, built for S. A. Wheeler and Joel Ames who jointly owned a half interest and Alvah Crocker, owning the other half, was acquired by Crocker in 1864 who sold it to the Crocker Burbank firm in 1871.

At the time of Alvah Crocker's death in 1874 these seven mills had a daily output of seventeen tons of paper. Between 1876 and 1909 the company operated as a private partnership and among those partners were: Charles T. Crocker, Samuel E. Crocker, George F. Fay, Alvah Crocker, George H. Crocker, Edward S. Crocker and C. T. Crocker, Jr. In 1909 the partnership merged into Crocker, Burbank & Co., Inc.; three years later it became Crocker, Burbank & Co., Inc.; three years later it became Crocker, Burbank & Co., Inc., a Massachusetts corporation, and the Wachusett Realty Trust. C. T. Crocker, Sr., died in 1911. On June 30, 1917, Crocker, Burbank and the Trust company were merged into the present form of Crocker, Burbank & Co. Assn.

The entire output of Crocker, Burbank & Co. Assn. clears through two sales outlets—Linton Bros. & Co. and Crocker Burbank Papers, Inc., both with Fitchburg headquarters. Founded in 1865, Linton Brothers started in Pawtucket with a small converting mill featuring the production of bristol board. Around the turn of the century Crocker Burbank commenced producing bristol by a simpler process. In 1912 Norman Harrower joined the Crocker Burbank organization and a year later bought a partnership in the Linton firm. In 1915 when the second Linton brother died Mr. Harrower, president of the firm moved it to Fitchburg and in 1928 it purchased the office building formerly used by the Parkhill Mill on Rollstone street. In 1939 Crocker Burbank Papers, Inc., was organized as sales agency for the company's book and converting manufacture, superseding Clark & Co., of New York City.

At the time this history is being written in 1940 the officers of Crocker, Burbank & Co. Assn. are: Charles T. Crocker, president and treasurer; Douglas Crocker, vice president, assistant treasurer and secretary; Bigelow Crocker, vice president and assistant treasurer; C. T. Crocker, 3rd vice president and assistant treasurer; Norman Harrower, vice president; Ralph M. Beckwith, vice president.

More than one thousand men and women are employed at wages aggregating more than one and one-half million dollars annually.

From its founding in 1826 by Alvah Crocker the control of the company has been consistently in the hands of Crockers. Crocker Field in Fitchburg, one of the finest athletic fields in America, was donated by Alvah Crocker, a grandson of the founder.

The first Alvah Crocker was born in North Leominster in 1801, the son of a pioneer paper maker. Alvah was eight years old when he went to work in a paper mill receiving twenty-five cents for a twelve hour day. In 1820 he left his home in Leominster and found work in a paper mill in Franklin, New Hampshire, where he remained until 1823 when he secured employment with General Leonard Burbank said to be the first paper maker in Fitchburg. After three years with the General young Crocker launched his first independent venture; laboring in his mill by day and driving his team to Boston at night with its load of finished printing and writing paper.

Bergstrom Paper Company, Neenah, Wisc.

The Bergstrom Paper Company of Neenah, Wisconsin, organized by D. W. Bergstrom, S. H. Bergstrom and J. N. Bergstrom took over the Winnebago Paper Mills in 1904 from D. R. and W. L. Davis.

In 1912 a new mill was added for the production of white book paper and in 1919 another paper machine and auxiliary equipment were added and the original mill dismantled.

Numberless improvements have been made during the succeeding years by which the plant has kept pace with the developing technique of producing white book.

P. H. Glatfelter Co., Spring Grove, Pa.

One hundred and seventy-five years ago the pioneer iron bloomery west of the Susquehanna was in operation at Spring Forge, Pa., supplying materials for the Continental Army when the British were in control of the eastern part of the colonies.

The bloomery, under the direction of the old iron master Daniel Shireman, continued until 1851 when Jacob Hauer bought and converted the forge buildings into a paper mill.

Twelve years later, a few days after President Lincoln passed through Spring Forge on his way to make his historic address in 1863 at Gettysburg 20 miles away, P. H. Glatfelter, who had been working in a paper mill in Maryland, bought the property from Mr. Hauer and established the Spring Forge Mill. Operation was not begun, however, until July 1864.

P. H. Glatfelter

The capacity of the mill was 1500 lbs. daily, made on one 50 inch machine. In 1874 the mill was moved to its present site and an 82 inch machine and speedier auxiliary equipment were added, bringing the production to about 8,000 lbs. daily.

The product of the early mill was newsprint made from rye straw. The company owned large large box-cars, known as "barns," which were sent out over the railroad to pick up the straw and waste from cotton gins.

The mill continued to grow and by 1890 had installed the largest and fastest machine in existence, 102 inches. George W. Childs, of the *Philadelphia Public Ledger*, had pioneered the world's largest Hoe presses and he founded the mill at what had now become Spring Grove (incorporated 1882) the only one capable of supplying the required 94 inch rolls.

The first pulp mill to make pulp from pine as well as poplar wood by the soda process was built. Because of this, and with the addition of other equipment in 1895, the product was changed to book papers, bonds, writings, mimeographs, tablet and lithograph papers, with a daily capacity of 110,000 pounds.

With the completion in 1922 of again the world's largest fine paper machine 170 inches the paper capacity became 200,000 lbs. per day and 75,000 lbs. of pulp. The modernization program at this time was carried out by the second Glatfelter generation under the active direction of President W. L. Glatfelter.

His son, P. H. Glatfelter, began taking active charge in the early twenties and immediately set up a long range expansion program that was to double the output of the mill of both pulp and paper. The program entailed an expenditure of some $2,000,000.

On the death of his father, in 1930, P. H. Glatfelter became president.

Mr. Glatfelter had launched his ten year modernization program in 1928 beginning with the installation again of one of the largest fine paper machines, 190 inches. This increased the productive capacity to 300,000 lbs. Though at times during the depression years it seemed it might be wise to delay some of the projects, they were confidently carried forward as scheduled.

All obsolete equipment has been replaced; many thousands of feet of floor area have been added to house modern air conditioned finishing and stock rooms, the latest type of pulverized coal burning high pressure boilers, complete new beater rooms, and an entirely remodelled pulp mill with doubled capacity. The pulp mill carried a $750,000 investment with the old equipment completely replaced.

P. H. Glatfelter Co., Spring Grove, Pa.

Crown Zellerbach Corp., San Francisco, Cal.

The Crown Zellerbach Corporation was established in San Francisco, Cal., in 1918 with the merger of the Crown Willamette Paper Company and the Zellerbach Corporation.

The Crown Willamette Paper Company was founded in 1877, when the mill of the California Paper Company was started at Stockton, California, manufacturing newsprint and coarse varieties of paper from rags and straw, the latter being obtained from wheat growing ranches in that vicinity. William Pierce Johnson, late chairman of the board of Crown Willamette Paper Company, assumed management of the Stockton enterprise in 1882. A material change was made in paper manufacturing in the '80s, when wood began to be used as the raw material for newsprint and wrapping paper pulps, replacing rags and straw. The new wood-pulp competition from the East soon forced the California Paper Company out of business; this resulted in Mr. Johnson and his associates organizing in 1889 the Willamette Pulp and Paper Company for the manufacture of newsprint at Oregon City, Oregon, where an abundance of the necessary pulpwood and power for grinding were available.

In connection with this operation, a pulp mill was founded on Youngs River, near Astoria, Oregon. At that time logging was done with oxen. Pulp from this mill was awarded a bronze medal at the World's Columbian Exposition held in Chicago in 1893. In 1885 a group from Portland, Oregon, formed the Columbia River Paper Company to construct a newsprint and coarse wrapping paper mill at Camas, Washington, on the north shore of the Columbia River, 15 miles east of Portland, Oregon.

About the same time the Crown Paper Company at Oregon City, Oregon, was formed. This company operated a paper bag factory at San Francisco until the San Francisco fire in 1906. It was in this factory that Louis Bloch went to work tying up bundles of bags.

The Lebanon Paper Company, formed in 1892 for the production of wrapping paper, was located on the Santiam River, at Lebanon, Oregon. In 1899, the interests controlling Crown Paper Company organized Floriston Pulp and Paper Company in the high Sierras, at Floriston, California, for the manufacture of wrapping and tissue papers. The mill began operation in June, 1900.

What is now the Western Transportation Company had an interesting history in serving the pulp and paper industry in Oregon. The Western Transportation & Towing Company was established in 1902, and with tugs and barges served the Crown Columbia Pulp and Paper Corporation on the Columbia River. The Willamette Navigation Company was established in 1912, and with a fleet of tugs and barges served the Willamette Pulp and Paper Company on the Willamette River.

Many enterprises formed the background for the Crown Willamette Paper Company. A series of mergers began in 1905 when Crown Paper Company and the Columbia River Paper Company were merged as the Crown Columbia Pulp and Paper Company. In 1912 the Crown Columbia Pulp and Paper Company absorbed the Floriston Pulp and Paper Company and the corporate name was changed to Crown Columbia Paper Company. Then in 1914 the Crown Columbia Paper Company and the Lebanon Paper Company were merged with the Willamette Pulp and Paper Company to form the Crown Willamette Paper Company.

CHAIRMAN LOUIS BLOCH IS PRESENTED WITH HISTORIC PAPERWEIGHT

This series of mergers brought a number of newsprint, coarse wrapping papers and tissue mills under one operation. In 1915 the Crown Willamette Company was formed, as a subsidiary to itself, Pacific Mills, Limited, at Ocean Falls, B. C. Development of power, construction of mills and creation of a town followed under personal supervision of A. B. Martin, now executive vice-president. Other subsidiaries of Crown Willamette Paper Company were Pacific Coast Supply Company, Western Waxed Paper Company, Canadian Crown Willamette Company, Ltd., Santiam Power Company, Sierra Flume Company, Western Paper and Bag Company and Pioneer Fruit Wrapper and Paper Company.

Through this long period of upbuilding Louis Bloch took a leading part. Speaking recently at a banquet honoring his 45 years of continuous activity with Crown Zellerbach Corporation and predecessor companies Mr. Bloch told of his advent to the paper business, saying: "The Crown Paper Company acquired a bag factory in San Francisco from one of its customers who had failed, and at seven o'clock one morning in March, 1894, I walked into that factory, donned a pair of overalls and thus made my debut into the paper business." Mr. Bloch is chairman of the board of Crown Zellerbach Corporation.

Turning now to the Zellerbach group of companies, we find listed in the San Francisco Directory of 1868 as a "merchant" the name of Anthony Zellerbach, father of I. Zellerbach (chairman of the executive committee and father of J. D. Zellerbach, president of Crown Zellerbach Corporation). It appears, however, that Mr. Anthony Zellerbach's first contact with the paper business was in 1870.

I. Zellerbach joined the business in 1888. Subsequently branches were established at Los Angeles, Oakland, Port-

I. ZELLERBACH | J. D. ZELLERBACH | R. A. MCDONALD | H. L. ZELLERBACH | A. BANKUS | W. P. JOHNSON

land, Seattle, Salt Lake City and other Pacific Coast towns. Until 1914 Zellerbach Paper Company was strictly a merchandising business handling all kinds of paper and paper products. In 1014 the first venture was made in manufacturing. National Paper Products Company was formed for the conversion in San Francisco of paper towels and toilet tissues, and later a mill was built at Stockton for the manufacture of solid fiber and corrugated packing cases and cardboard cartons. The next step was acquisition of a plant at Carthage, New York, where towels and toilet tissues were manufactured and converted for the eastern market. Another manufacturing venture was undertaken in 1919 by organization of Washington Pulp and Paper Corporation with mills at Port Angeles for the production of newsprint. In 1927 Fibreboard Products, Inc., was formed for the purpose of merging several coast board mills and converting plants, the controlling interest of which is jointly owned by Paraffine Companies, Inc., and Crown Zellerbach Corporation.

In the photograph at the top of page —, Louis Bloch, chairman of the Crown Zellerbach Corporation, is shown at the right receiving a bronze paperweight from Otto Erickson, made from a piece of the old-type digester of the West Linn Mill that had passed through a fire. The photograph was taken last August when Mr. Erickson visited San Francisco to receive from Mr. Bloch a 50-year diamond service pin. Mr. Erickson entered the service of a predecessor company at West Linn, Ore., on August 15, 1889, as a carpenter, later becoming a millwright and serving in that capacity until he voluntarily retired in October, 1940.

Construction was started on the National Paper Products plant at Port Townsend, Washington, in the fall of 1927. The first unit of this plant, which manufactures kraft board, was put into operation in the fall of 1928, and the second unit in May of 1929, manufacturing kraft paper.

The Zellerbach Corporation came into existence in 1924 as a holding company to consolidate the various Zellerbach interests and activities. Its subsidiaries at that time included Zellerbach Paper Company, Washington Pulp and Paper Corporation, National Paper Products Company and the Sanitary Products Corporation, a jobbing and distributing organization for eastern territory, and the American Investment and Realty Co.

In 1928 the merger arrangements led to the creation of Crown Zellerbach Corporation. By an exchange of stock the new corporation became the owner of all of the common stock of Crown Willamette Paper Company with its subsidiaries. More than half a century of unbroken business relations between these two institutions preceded this merging of interests.

Today, Crown Zellerbach Corporation has an annual producing capacity of 550,000 tons of paper, and partly-owned board mills have an annual capacity of 225,000 tons of boxboard and boxboard products.

There are approximately 20,000 stockholders. Nearly ten thousand employees are enrolled in the Crown Zellerbach Corporation and partly-owned board mills with in excess of 4900 of the employees wearing continuous service emblems ranging from five to fifty years.

The Crown Zellerbach Corporation expends about $11,000,000 annually on the Pacific coast for supplies other than pulp timber and machinery. These supplies range from oil, lime rock, salt cake and sulphur to wool from thousands of sheep necessary in the manufacture of paper machine felts. While predecessor companies pioneered both research and good forest practices many years ago, Crown Zellerbach Corporation officials today emphasize these elements as being increasingly important. Recently the corporation constructed and modernly outfitted, at Camas, Washington, one of the most central research laboratories and technical departments in the pulp and paper field.

Within the past several months the corporation has attracted to its forest management department Eric J. F. Brandstrom, who for many years has been forest economist at Portland, Oregon, for the United States forest service. Along with experienced operating officials who have years of experience in forest management, Mr. Brandstrom will apply the results of his long study of perpetual yield to the corporation's vast timber holdings in order that there will be a complete independence of pulpwood supply for many years.

Officers of Crown Zellerbach Corporation are: chairman of the board, Louis Bloch; chairman of the executive committee, I. Zellerbach; president, J. D. Zellerbach; executive vice-president, A. B. Martin; executive vice-president, R. A. McDonald; executive vice-president, H. L. Zellerbach; vice-president and treasurer, Thos. McLaren; vice-president, A. Bankus; vice-president, J. Y. Baruh; vice-president, D. S. Denman; vice-president, A. B. Lowenstein; vice-president, F. N. Youngman; secretary, D. J. Goldsmith; controller, A. L. Bennett; director of industrial relations, A. R. Heron.

Directors of Crown Zellerbach Corporation are: J. Y. Baruh of Los Angeles and M. M. Baruh, Louis Bloch, Charles R. Blyth, Herbert Fleishacker, A. F. Martin, R. A. McDonald, Thos. McLaren, E. M. Mills, J. H. Schwabacher, G. S. Towne, H. L. Zellerbach, I. Zellerbach, J. D. Zellerbach of San Francisco.

Members of the executive committee are: Louis Bloch, A. B. Martin, R. A. McDonald, Thos. McLaren, H. L. Zellerbach, I. Zellerbach, J. D. Zellerbach.

Crown Zellerbach products comprise a very large line of paper and paper products including newsprint, sulphite papers, wrapping and toilet tissues, bags, kraft and sulphite liner boards, towels, waxing sulphite, waxing tissue and many other standard and specialty items.

French Paper Co., Niles, Mich.

The French Paper Company was established in 1871 at the time a dam was constructed across the St. Joseph River at Niles, Michigan. In 1872 six grinders were running by direct connection to water wheels producing ground-wood pulp from the silver poplar wood prevalent in the adjacent territory.

By 1881 the firm was known as the Michigan Wood Pulp Company with J. W. French, the founder as President. That year a 72-inch six cylinder board machine was installed. With a production of only 7500 pounds in twenty-four hours this was reputed to be the largest per machine board production west of the Alleghany Mountains. Between 1893 and 1895 two Fourdrinier machines were added to produce newsprint. By 1904 when the firm name was changed to French Paper Company the Fourdriniers were employed exclusively on book papers.

The founder, J. W. French, died in 1907 and was succeeded by his son, J. Edward French, who continued as President until his death in 1931. For eight brief months thereafter another son of the founder, F. J. French, served as President until his death.

Since 1931, a grandson of J. W. French and son of J. Edward French, Frank G. French, has been President, with H. O. Parker as Vice-President and Treasurer, and L. F. Kretchman as Secretary.

The progress in grades of paper has been from the early ground-wood pulp, wood-pulp board, newsprint, book papers, and today the production is entirely such business papers as bond, ledger, and duplicating as well as the better quality lithographing papers and paper specialty grades.

The Crystal Tissue Co., Middletown, Ohio

The Crystal Tissue Co. was established in 1827, near Middletown, Ohio. From a beginning in 1827 as a water-power saw-mill to the present modern tissue mill is a growth that could be found only in a progressive country such as we live in. Because of the abundant water power supplied by the Miami and Erie Canal, Adam Dickey, in 1827, started a saw mill on the site now occupied by the Crystal Tissue Company. As the country became more settled, the demand for lumber decreased and the establishment of farms created a new demand and the saw mill was converted into a flour mill. The operation of the flour mill continued almost without interruption until 1886 when it was converted into a strawboard paper mill, still using as raw material the product of the local farmers.

The first operation of the Crystal mill as a maker of tissues came a few years later when Dr. Thornton, principal of a high school in Cincinnati, Ohio, took charge of the plant and began the manufacture of light weight papers. This venture was not successful and the mill was closed for several years until in 1894 it was reopened by J. W. Van Dyke and operated by him as the Crystal Paper Company. In 1894, occurred on of those industrial revolutions that destroy the old and create new ideas, methods and products. This was the introduction of the packaging of foods. The wrapping of crackers and cookies in wax paper created a demand for this type of paper that the Crystal Paper Company under Van Dyke filled. Right then began the growth of the Crystal mill to its present place in the tissue and waxed paper industry.

In 1902 Mr. Van Dyke, now president of the Atlantic Refining Company of Philadelphia, Pa., who was in financial control of the Crystal Paper Company, prevailed upon D. E. Harlan to take over the management of the company. While Mr. Harlan had an engineering background, he was also widely experienced in management and selling, and this combination was a strong contributing factor in the success of the Crystal Paper Company under his direction.

When Mr. Harlan came to Middletown, he found the mill poorly equipped and poorly managed. The two machines, one a 60-inch Harper Fourdrinier, the other a 60-inch Cylinder that had been in use by the old strawboard company and later rebuilt to make tissue paper, were in a dilapidated condition. These two machines were all the equipment the plant had. The Harper Fourdrinier was being operated on 22 pound paper which was waxed to 30 pounds. The Cylinder was making light weight tissues.

Mr. Harlan quickly sized up the situation. His engineering mind told him the equipment would have to be changed. His experience in management told him that the personnel of the company would have to be reconstructed. The plant was shut down for eight months to make these changes. The Harper Fourdrinier was changed into a cylinder machine and the other paper machine was put in good mechanical condition. And from that day on, the Crystal Paper Company went ahead consistently year after year, constantly adding to its equipment, its working force, and its output of tissue paper items. Its financial growth has kept pace. Its products are the standard of comparison wherever they are used.

In 1905 the business had grown to such proportions that an 80-inch machine was added. In 1906 one of the old Cylinder machines was replaced with a 100-inch machine. A 100-inch machine was unheard of in the manufacture of tissue paper. Mr. Harlan was ridiculed but his engineering training told him that the problem in building tissue paper machines was a problem of controlling vibration. When he tried to place the order with the paper machinery manufacturer for a 100-inch machine, the manufacturer emphatically refused to accept any responsibility for the performance of the machine. Mr. Harlan told the manufacturer to go ahead and build the machine as he specified it, and that he would take the responsibility for the outcome. The machine was built. It was installed and it was made to work. From that day the width of tissue paper machines has increased until today light weight tissue paper is made 168 inches wide.

The Crystal Paper Company was now operating three machines, a 60, an 80 and a 100-inch. But still this was not enough to take care of the rapidly growing business. The years 1911 and 1912 saw construction of a new mill and into this new mill went a 120-inch machine, the widest light weight Cylinder tissue paper machine in the world. Again a new use of tissue paper was making its demands. It was for tissue paper from which to make paper rugs or carpets for porches, summer homes and the like. Though known as fiber rugs, actually they are made of tissue paper, and much of the paper is made by the Crystal Tissue Company. The paper carpet industry uses large rolls of paper 60 inches wide. So, the 120-inch machine would turn out two 60-inch rolls. It took well into 1912 to get the various paper machinery manufacturers to turn out the necessary parts for a 120-inch machine. And again the company went through a very trying experience before the machine actually was satisfactory.

The effect of this development on the costs of Crystal products was tremendous. It permitted the company to reach out steadily after business in fields that were previously unable to afford tissue paper. And it permitted Crystal to meet anyone on price in the high quality range of tissues. Crystal has kept constantly after the problems of making better tissue at less cost. For instance, it used to take twelve girls to count the tissue that is put up in ream packages. A ream is 480 sheets. But Crystal was among the first to install a machine which lays out the tissue in the required number of sheets, so that the girls have only to count the units instead of the single sheets.

In 1920 occurred a new epoch in the history of the Crystal Company. When Harlan was manager of the Lima Steel Casting Company of Lima, Ohio, back in 1900, Z. W. Ranck was his pattern boy, and general office boy. When Mr. Harlan came to Middletown to manage the Crystal Paper Company he sent for Mr. Ranck to be his bookkeeper. When Mr. Harlan retired in 1920, he made it possible for Mr. Ranck to take over the management of the company he had served so long and faithfully. During those years Mr. Ranck had equipped himself to take over this leadership. Not only did he know how things were to be done, but he had actually done them himself.

Mr. Ranck organized the present Crystal Tissue Company on July 1, 1920, and took over the active management. Soon after he took charge, the use of waxing paper took a new turn. Manufacturers began using more waxed paper to wrap candy kisses. Special machinery had been invented to do the wrapping. This required a special sheet that would feed through wrapping machines rapidly and would not tear when it was automatically twisted around the candy kiss.

E. E. Grant

L. J. Long

E. A. Cahill

The technical department of the Crystal Tissue Company, as in many other instances, worked with the manufacturers and developed a special sheet for this purpose. Another important market for Crystal products was opened and to take care of this business another 120-inch machine was installed, in 1923.

Still wider markets for tissue papers were developed during the years following 1923, necessitating expansion of the equipment of the Crystal mill. To keep ahead of this demand and to keep the mill up to date, many changes and additions were made. In 1927 a 100-inch Fourdrinier machine was installed and in 1930 a 120-inch Fourdrinier. These machines were designated as No. 6 and No. 7 and completed the complement of machines now in use, making tissues of all grades.

Additional paper-making machines have meant additional power needs, which have been amplified and improved almost yearly as more power was needed, using the most modern coal-handling, firing and energy producing equipment. In this same period a water softening plant was installed, and a new bleach house for the preparation of bleach liquor was built. In 1931 a new and modern office building was erected.

During this expansion greater markets were being developed and a need was seen for a complete tissue converting mill. Consequently, in one of the buildings were installed modern high speed printing presses for printing gift wrapping tissues, interfolding machines for toilet papers, and a complete work room for the packaging of thousands of tissue paper items daily. Among these items are tissue rolls for Christmas and everyday gift packaging, manifold bond for printing and train-order tissues. Today the Crystal mill produces tissue papers in scores of grades and weights and does the complete job, from the pulp to the finished package ready to go to the ultimate consumer.

The company now has 201 employees and has carried group insurance since 1929, and this year at no cost to employees, the company has increased the group coverage 50 per cent.

In 1939 Mr. Ranck died and the group he trained assumed his responsibilities. E. E. Grant became president, L. J. Long, vice-president and general manager; Elizabeth A. Cahill, secretary and treasurer; V. H. Larsen, vice-president in charge of sales, and H. H. Harrison, vice-president in charge of manufacturing.

Deerfield Glassine Co.

The mills of the Deerfield Glassine Company are located in Monroe Bridge, Massachusetts, on the Deerfield River, at a site where paper has been manufactured for over fifty years.

The original mill was built by the James Ramage Paper Company in 1887 and was operated on various grades of paper until 1927.

In 1927 the Deerfield Glassine Paper Company was formed under the active leadership of Joseph Wallace, the late prominent paper mill engineer and operator. A second fourdrinier paper machine was installed, a new supercalender room with five stacks of heavy duty glassine calenders were added, and the beater room was completely revamped and supplied with the special equipment used in beating glassine stock. The change over to a Glassine mill has required the expenditure of nearly one million dollars.

Associated with Mr. Wallace were a number of bankers and industrialists mostly from the middle west. These men are for the most part still associated with the company as directors with the active management resting in the hands of its president and treasurer, Paul E. Hodgdon, who is assisted by W. A. Wylde in production and sales, and Richard J. Doolin, assistant treasurer. Floyd Creek is superintendent.

A list of the officers and directors of the company since its formation in April 1927, follows:

President: Joseph H. Wallace, April 1927-July 1934; E. J. Costigan, July 1934-Feb. 1935; Paul E. Hodgon, Feb. 1935-Present.

Plant of Deerfield Glassine Co.

Vice-president: Wm. G. Shortess, April 1927-Nov. 1929; Ira J. Owens, Feb. 1929-Dec. 1929; Wm. C. Ross, Jan. 1930-Present; E. J. Costigan, Feb. 1935-Present.

Treasurer: Wm. L. Ross, April 1927-Feb. 1935; P. E. Hodgdon, Feb. 1935-Present.

Secretary: Frank E. Greenwood, April 1927-Jan. 1930; Joseph Poole, Feb. 1930-July 1934; Phil S. Dickinson, July 1934-Present.

Assistant Treasurer: J. A. Buell, April 1927-Nov. 1928; F. J. Bickerstaff, Nov. 1928-Aug. 1929; Ward M. Willets, Aug. 1929-Mar. 1930; Charles Scudder, July 1934-May 1936; R. J. Doolin, Feb. 1935-Present.

Assistant Secretary: Miss C. Fream, April 1927-July 1934; Max M. Mason, July 1934-Present; W. A. Wylde, Feb. 1935-Present.

Directors: Joseph H. Wallace, Apr. 1927-July 1934; Wm. G. Shortess, Apr. 1927-Nov. 1929; Wm. L. Ross, Apr. 1929-Present; E. J. Costigan, Sr., Apr. 1927-Present; Frank E. Greenwood, Apr. 1927-July 1930; Ira J. Owens, Feb. 1929-Dec. 1929; K. S. Dickinson, Feb. 1929-Present; Charles Scudder, Feb. 1929-Present; Joseph Poole, Nov. 1929-July 1934; George M. Seaman, July 1930-1936; Paul E. Hodgson, July 1930-Present; Phil S. Dickinson, July 1934-Present; Charles L. Kraft, July 1934-1939; Charles R. Stoddard, July 1935-May 1936, E. J. Costigan, Jr., Nov. 1939-Present; Earl M. Wyman, Apr., 1940-Present; Samuel C. Scudder, Apr. 1940-Present.

Eastern Corp., Brewer, Maine

The Eastern Corporation, then Eastern Manufacturing Company, was incorporated in February 1889, at which time it commenced the manufacture of unbleached sulphite pulp in a newly constructed mill adjacent to a large tidewater saw mill in Brewer, Maine, owned by the incorporators—the Ayer family—its purpose being to convert the waste spruce saw mill slabs into pulp. The saw mill ownership, dating back to 1884, was transferred to the Eastern in 1904, and this business was operated by the company until 1916, when it was discontinued.

The acquisition of the saw mill property brought to the company a considerable acreage of timberlands to support its spruce wood requirements for pulp. At present extensive tracts of timberland are for this purpose owned or controlled in Eastern Maine and Nova Scotia.

Through the years the Brewer pulp mill was enlarged to its present capacity of 120 tons per day, and facilities provided for manufacture of the highest grades of bleached sulphite for paper making as well as dissolving pulps for rayon, plastics and nitrating. This mill was among the first to commercially produce suitable pulp for the manufacture of rayon silk yarn.

In 1896 the company built a one-machine paper mill adjacent to the Brewer pulp mill and commenced the conversion of a portion of its pulp into manilas and other coarse papers. In 1901 and 1902 two more paper machines were added, and the manufactured product changed from coarse to fine papers. The scope of the fine paper business at this mill was expanded in 1905 to include rag papers, a phase of the business which was continued until 1934. The present capacity of the Brewer paper mill is 100 tons per day of fine writing papers and paper specialties.

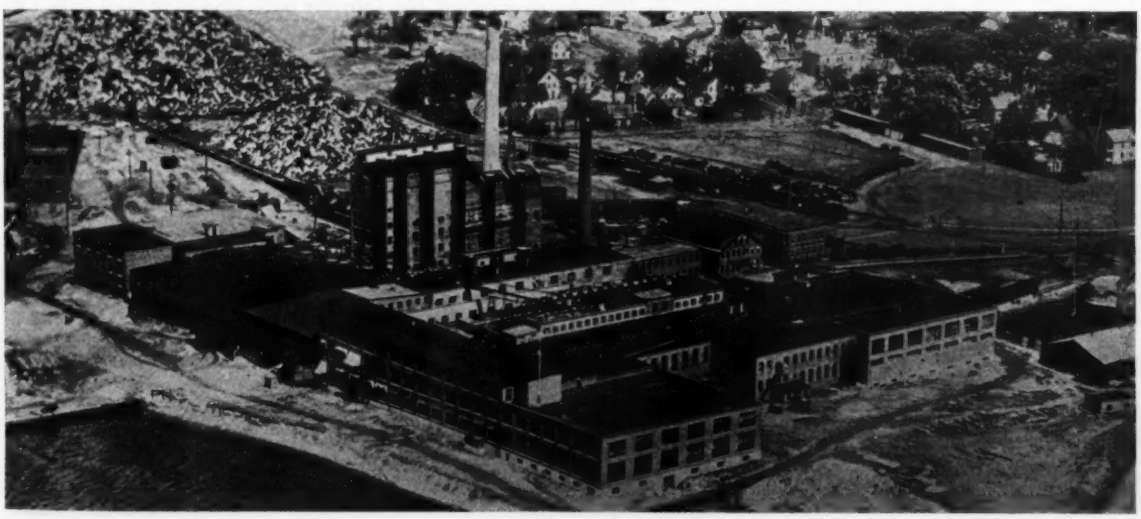
The Katahdin Pulp and Paper Company of Lincoln, Maine, was taken over in 1915 and has since been operated as a division of Eastern. These mills have been extensively rebuilt and modernized, producing at present 75 tons per day of bleached sulphite paper pulp and 50 tons per day of sulphite bond paper.

The Eastern Electro-Chemical Company was organized in 1916 and a plant built adjacent to the Brewer mill to produce bleach liquor for the pulp mills. This company was absorbed by Eastern in 1921.

In 1930 the Orono Pulp & Paper Company at Basin Mills, Maine, was purchased, and at present the pulp mill is operated, producing 50 tons per day of unbleached sulphite pulp.

The general offices of the company are located at the Brewer Mill as well as general sales and advertising headquarters for the company's domestic and export paper and pulp business. Division sales offices for paper products are maintained in Boston, New York, Chicago, Washington and New Orleans.

The Paper Mills of Eastern produce a wide variety of fine business papers under the general brand name of "Eastco" which are sold through paper merchants throughout the country and at many foreign points. The company's leading mill brand paper is Atlantic Bond, a genuine water-marked sheet used for letterheads and business forms. The Atlantic line also includes Atlantic Ledger, Mimeo Bond, Duplicator, Cover, Duropake, Manuscript Cover, Manifold, Writing and Vellum. Another popular Eastco mill brand is the Manifest line.



Mill of the Eastern Corporation

Franklin Paper Co., Holyoke, Mass.

The Franklin Paper Company was established and incorporated under the laws of Massachusetts on Jan. 2, 1866, in Worcester, Mass., by Calvin Taft of that city, James H. Newton of Holyoke and E. Newell Taft of Northbridge. Mill and water rights were secured in Holyoke and manufacture started on a line of French folios, colored flats and envelope paper. Later a substantial and novel business was developed in the manufacture of paper for reversible collars, a forerunner to the rubber and celluloid collars.

Up to 1882, changes in the personnel included E. C. Taft, F. H. Chamberlin, E. W. Chapin and John Ramage, serving at different times as directors of the company. The death of Calvin Taft at this time terminated the Taft interests and James H. Newton became president with Ed. T. Newton and F. H. Chamberlin later becoming directors.

In 1892 the Company was purchased by the present management under the leadership of James Ramage. The paper machine was now changed from Fourdrinier to cylinder and the production to that of tag boards, silk wrapping and duplex patent coated papers which gradually changed into the present lines of manufacture; White and colored mill bristols, index, sample card, post card, jewelry card, duplex, white blanks and cylinder specialties.

The present officers of the company are: George C. Watson, president and treasurer; James B. Ramage, vice-president; Arthur R. Ingham, assistant treasurer and Robert M. Swaney, secretary.

The products of the Franklin Paper Company are distributed by jobbers throughout the United States and Canada.

The lines of the company include, Jefferson Index, Beta Index, White and Colored Franklin Bristol, National Cream Post Card, Franklin Duplex Bristol, Franklin Inlaid Bristol, Victory Blanks and Franklin Special Blanks. These different grades are used for card indexes, posters, display cards and advertising: menus, photo mounts, sample cards for displaying worsted, woolen and fancy cotton goods, post cards, and other items.

Esleeck Mfg. Co., Turners Falls, Mass.

The Esleeck Mfg. Co. was established at Turners Falls, Mass. In 1900 the late A. W. Esleeck purchased the Marshall Paper Company of Turners Falls. Mr. Esleeck was born in Texas of British (Welsh) ancestry, and spent a number of years in the paper industry in Holyoke before establishing his own business in Turners Falls.

Soon after the Marshall Paper Company was acquired, the name was changed to the Esleeck Manufacturing Company and that concern was the pioneer in the manufacture of rag content onion skin and manifold papers, which today are considered "the standard" throughout the United States.

The Esleeck Manufacturing Company is the only concern in the country specializing in rag content onion skin, manifold and other thin typewriter papers. For more than 40 years their entire efforts have been concentrated in this one channel. Research in the study of thin paper requirements, plus special equipment particularly adapted for producing the grades they manufacture, enable the company to furnish paper of uniform quality, weight and finish.

Esleeck thin papers, owing to their light weight for typing and mailing, strength for erasing and handling, permanency for valuable data, also minimum bulk for filing are in demand for office and factory for records, forms, thin letterheads, copies, advertising literature, and for other uses.

The present officers are Irving N. Esleeck, president; F. R. Andrews, treasurer, and W. H. Wood, secretary.

Esleeck Mill at Turners Falls, Mass.

Great Northern Paper Co., Millinocket, Me.

The Great Northern Paper Company, now the largest newsprint producer in the United States, came into being in 1899, through the efforts of the late Garret Schenck, of Weston, Mass. One of the most prominent figures in the paper industry, Mr. Schenck, who learned the paper business in the Bird & Son mills at East Walpole, Mass., had up to that time been active in the building of paper mills, among others the mills at Great Works, Orono and Rumford, Maine.

Upon formation of the International Paper Company in 1898, Mr. Schenck sold his Maine properties to them and at once started promotion of a new and most ambitious newsprint project at Millinocket, Maine, on the Penobscot River where a water power with 110 feet head invited development. Associated with Mr. Schenck in this venture were Col. A. G. Paine, Col. Oliver Payne and William C. Whitney of New York, Col. Edward Haskell of Boston, Charles W. Mullen of Bangor, Maine, and others. The original company formed in 1898 was known as the Northern Development Company, the name being changed to Great Northern Paper Company early in 1899, when construction of the 8 machine mill at Millinocket was started. At that time the company was capitalized at $5,000,000 and had acquired 260,000 acres of timberlands on the West Branch of the Penobscot River.

Garret Schenck

William A. Whitcomb

Before the Millinocket mill had been completed the Manufacturers Investment Company, which operated a mill at Appleton, Wis., and another at Madison, Maine, built about 1891, and of which Col. Oliver Payne was an officer and large stockholder, went into bankruptcy. The Madison property was promptly acquired by the new Great Northern Paper Company and was the first plant to be operated under its name, turning out at that time 55 tons of newsprint, 50 tons of sulphite pulp, and 40 tons of groundwood pulp per day.

The Millinocket mill started up on November 1, 1900, with capacity of 240 tons of newsprint per day. Its building had involved the transportation into the Maine wilderness of thousands of tons of materials, and the building of roads, dams, and a town capable of housing some 2,000 people, in addition to the erection of mill buildings and the installation of machinery—a tremendous undertaking for those times. The work was carried out under the direction of Hardy S. Ferguson, still one of the foremost paper mill engineers in the country.

Expansion of the new company, fostered by the growing use of newsprint, was rapid. In 1907, another new mill, arranged for four paper machines, was built at East Millinocket, Maine, ten miles below the Millinocket plant. The construction of this plant, known as the "Lower Mill", involved the building of a dam to 25 foot head and a grinder room and paper mill at "Burnt Land Rips" and a second dam to 50 foot head, with a grinder room and hydro-electric station at "Dolby Rips" about a mile above. The town of East Millinocket was developed around the paper mill site. The Lower Mill went into operation in August 1907, with three machines, producing 120 tons of newsprint per day. The fourth machine was added in 1913. Production of the Millinocket mill was also stepped up, and by 1910 the original eight machines were producing over 300 tons per day. Timberland holdings had been increased to keep step with the company's new output.

In November 1910, William A. Whitcomb came to the Great Northern Paper Company as general manager. Mr. Whitcomb had served his apprenticeship with the Glens Falls Paper Mill Company, and had been with the International Paper Company for twelve years, resigning his position as vice-president of that company to come to the Great Northern Paper Company.

During the early days of the company, sales of its product were handled by Col. A. G. Paine. In 1901 the sales managership was taken over by Wm. B. Dillon, who was succeeded in 1912 by W. C. Powers, now with Peter Dixon Company of London, England.

In 1914 the machine room at Millinocket was enlarged, and a ninth machine installed. This was the first paper machine to run at a speed of 1,000 feet per minute. In 1916, a similar machine, No. 10, was installed, bringing the production of the Millinocket Mill to 430 tons per day. The high speed at which these machines were operated was made possible by the inventions of Elmer Pope, which were worked out in the Great Northern Mills.

The company had in 1903 obtained charter for a subsidiary known as the West Branch Driving and Reservoir Dam Company, which took over the privileges of the old Penobscot Log Driving Company, in regard to driving wood and storing water on the West Branch of the Penobscot. In 1916 to protect its rapidly growing need for hydraulic power, the company built the Ripogenus dam at Ripogenus Gorge on the Penobscot. This dam was at that time the largest storage dam ever built by a private corporation for its own use.

The next ten years represented a period of consolidation, modernization and gradual progress. New timberlands were acquired, bringing the company's holdings to over 1,000,000 acres by 1926. Suction roll equipment was added to paper machines, the Millinocket sulphite mill was enlarged, and the original hydraulic turbines were replaced with modern units. The Millinocket boiler plant was modernized. The Madison water power was redeveloped on the Anson side of the river in 1923, five vertical hydraulic units being installed.

Great Northern Paper Co., Millinocket Mill

In 1926 and 1927, two of the original paper machines, Nos. 7 and 8, were removed and replaced with higher speed equipment, to bring the Millinocket mill capacity to 650 tons. By modernization, the East Millinocket machines were at this time capable of turning out over 300 tons, and the Madison mill about 100 tons.

Garret Schenck died in January 1928, and was succeeded as president by Mr. Whitcomb, and Wm. O. McKay became manager of manufacture—the title of general manager being abolished. The sales manager's position had been taken over in 1919 by H. Merton Joyce, formerly treasurer of the company. H. Merton Joyce died in 1935, and was succeeded by A. R. Caspar, formerly assistant manager of manufacture. William Hilton succeeded Fred A. Gilbert as manager of the Spruce Wood Department in 1929.

The year 1928 marked the beginning of a new period in the company's development. In 1930, the Madison mill was converted to the manufacture of specialty papers. Between 1928 and 1934, the grinder room at Dolby was converted into a hydro-electric station; the old two-foot grinders at both Millinocket and East Millinocket were replaced by four-foot grinders of a new type designed by Mr. Whitcomb and now widely used throughout the industry; and in 1934 and 1935 a new power station, capable of developing 9300 hp. at 28 foot head was built at the existing dam at North Twin Lake, 5 miles above Millinocket. In 1936 a new concrete storage dam was built at Seboomook on the upper waters of the Penobscot River.

In 1937, construction of a new hydro-electric power station was started at Mattaceunk Rips, 10 miles below East Millinocket on the main Penobscot River. This station, containing three vertical units operating under 40 foot head, went into service, with two units operating, in November, 1939. The third unit was added in the spring of 1940.

The company's production at the present time is in excess of 1100 tons per day of newsprint, specialties and mill wrapper, all sold east of the Mississippi River. It has holdings of more than 1,800,000 acres of timberlands and developed water powers of 107,000 hp., of which 100,000 hp. is on the Penobscot River within 20 miles of the Millinocket mill, backed up by storage of 56 billion cubic feet.

Many changes have taken place in the financial end of the company. Payne Whitney, a director for many years, died in 1927, and was succeeded on the board of directors by his son, John Hay Whitney. Commodore Lewis Cass Ledyard, and his son, Lewis Cass Ledyard, Jr., were both members of the executive committee, and directors for a long term of years, and had under their direction the company's financial management and business policies. Commodore Ledyard died in 1932. Mr. Lewis Cass Ledyard, Jr., died in 1936, and was succeeded by Williamson Pell, president of the United States Trust Company of New York, who is now directing the general business and financial management of the corporation.

The present directors are: William O. McKay, Eustis Paine, Williamson Pell, F. S. Rollins, Hilbert Van N. Schenck, Benjamin Strong, Sheldon E. Wardwell, William A. Whitcomb, John Hay Whitney.

The officers, as at present, are: William A. Whitcomb, president; William O. McKay, vice-president and manager of manufacture; William Hilton, vice-president and manager Spruce Wood Department; A. R. Caspar, vice-president and manager of sales; Burt C. Ward, treasurer; Bryan L. Seelye, clerk.

L. L. Brown Paper Co., Adams, Mass.

The L. L. Brown Paper Company was established in 1849 at Adams, Mass. The founders were Levi L. Brown and his uncles, Daniel and William Jenks, who formed a partnership known as L. L. Brown & Co. The present name of the company was adopted in 1873 at which time the partnership of the concern became a corporation. Levi L. Brown, one of the original founders, became president. T. A. Mole, who joined the company as bookkeeper in 1866, was made treasurer.

In addition to the founders, Levi L. Brown and Daniel and William Jenks, several men prominent in the industry have been associated with the company. Among them were James Osbourn, general superintendent, and E. W. Streeter, assistant superintendent, both of whom served under the administration of Mr. Brown; C. C. Jenks, who succeeded Mr. Brown as president in 1894; and Arthur B. Daniels, president from 1896 to 1938. Mr. Daniels, who was one of the best known and most highly esteemed figures in the industry, had been with the company since 1878. The present officers are A. Millard Daniels, president and secretary; and Rupert B. Daniels, treasurer.

The L. L. Brown Paper Company has always been among the most progressive in policies and methods. In fact, the L. L. Brown mills form an interesting study in contrasts. There one sees the same conscientious care and thoroughness which formed the nucleus of the enterprise 91 years ago flourishing alongside the most modern equipment and methods.

The company is proud of the fact that one of its present staff, Herbert E. Harrington, cashier, has worked with several of those who were instrumental in guiding the enterprise in its earlier days. Mr. Harrington has been identified with the L. L. Brown Paper Company since 1880.

The mill originally chosen for this enterprise consisted of a small brick and wooden structure which occupied part of the site of the present main plant of the company. The daily productive capacity was limited to 1000 pounds. This parent mill, however, was carefully and fully equipped according to the standards of the day. As with the present mills of the company, the original plant was geared for the production of quality exclusively.

The founders did not operate their mill long before they realized the value of quality, and much greater facilities were required. The partnership thereupon acquired a large cotton mill nearby which was at once remodelled for paper manufacture. A constantly widening appreciation of L. L. Brown papers made even the increased capacity inadequate. So, in 1871 the original mill in which L. L. Brown and his associates began operations was remodelled and much enlarged. Since then that mill, and the second unit, now known as the Upper Mill and the Lower Mill, have been steadily expanding to keep pace with market requirements and manufacturing progress. Today these mills are among the most modernly appointed manufacturing plants in the country.

The first materials which the concern purchased consisted of white linen and cotton rags. From that day on all L. L. Brown permanent papers have been made from none but white rags. The policy which prevails in the selection of rags characterizes the choice of all other raw materials also.

The L. L. Brown Paper Company, although it has always specialized in ledger papers, includes among its products other lines, notably linens, bonds, parchments, onion skins, exchange cap, manuscript covers and typewriter papers. Ever since the company was founded, however, chief emphasis has been on record papers, especially those which must endure for unlimited years or withstand extreme handling.

For many years the L. L. Brown Paper Company had the distinction of being the only mills to manufacture genuine, hand-made paper on a commercial basis. The paper was used for de-luxe editions, engraved and embossed cards and for other exclusive use. Long after machine-made paper had generally replaced the manually fabricated article, the L. L. Brown Paper Company continued to have calls for the latter. Having always been known as manufacturers of quality papers exclusively, the company continued to be looked to as the source of supply by those who felt that no paper could be genuine quality unless it was hand-made. To care for this demand, the company maintained a department for this purpose until a comparatively few years ago.

Gulf States Paper Corp.—E-Z Opener Bag Co.

The Gulf States Paper Corporation was established in 1885. The history of the Gulf States Paper Corporation and the E-Z Opener Bag Company is almost the personal story of its founder, H. E. Westervelt, one of the grand old men of the paper business.

Perhaps the early "steps" can be best described in Mr. Westervelt's own words, quoted from a letter written in 1935, when the company published its "Fifty-one Years of Progress". Mr. Westervelt says: "My first experience in the paper business was in 1884 as salesman for the South Bend Paper Company, unincorporated. Early in 1885, I invested $500 (nearly all my capital) in a small idle straw wrapping paper mill at Marseilles, Ill. We hired Frank Brewer to run it. Mr. Brewer has been with us the fifty odd years since that time and is almost entirely responsible for any manufacturing success we have had. At Marseilles I also started a small paper jobbing business for myself. All my cash capital was $269.00, but credit and an ample supply of grocer's and butcher's straw paper from the mill was available. The procedure was to make a short trip out, then back to Marseilles to pack, mark, ship and bill the paper sold, attend to correspondence and collections, go to the bank and post office and work the local stores. After about a year, O. L. Hammond was employed, and he continued with our organization until his death in 1924.

Frank Brewer

H. E. Westervelt

F. M. Dickinson

"In February, 1887, my brother, E. C. Westervelt, acquired a small straw wrapping paper mill in Springfield, Ill. In 1889 I bought the mill. It was sold in 1893 when we, E. C. Westervelt, Frank Brewer, O. L. Hammond and I, decided to build a mill in Taylorville, Ill. We incorporated the Prairie State Paper Company; capital $40,000, with $26,000 paid in. The first Taylorville paper machine was an 86-inch two-cylinder built by Beloit Iron Works. The mill began production in October 1894, making twenty tons of straw paper a day, in two shifts. The next machine was a 126-inch Fourdrinier, making twenty to twenty-two tons of grocer's paper (wood pulp) a day, about 1910. We were running three eight hour shifts at that time.

"The Taylorville mill was sold to the Hopper Paper Company, for bond paper, when this company 'turned south', and is still in operation. Our first bag machines were built in 1897 in Taylorville, making the Atlas sugar bag.

"We undertook to design machines for 'E-Z Opener' bags, but expenditure was considerable, without results. It was a long slow pull for me, but was finally successful. Made E-Z Opener sugar bags for the market on April 10, 1902 (over three years after I undertook to personally design the machines) and made the lighter weight grocery bags two years later."

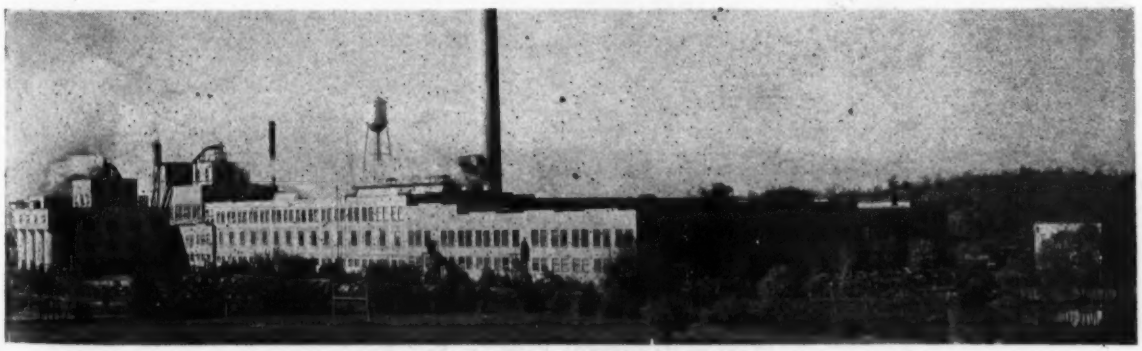
In 1907 the machine shop and equipment was moved to Taylorville, and the corporation name was changed from Prairie State Paper Company to the E-Z Opener Bag Company. The sales department was also moved to Taylorville and F. M. Dickinson became sales manager.

The history of the E-Z Opener Bag Company, as described by Mr. Westervelt, was the forerunner of the continued Taylorville mill (1894-1923); the bag factories at Fulton, N. Y. (1907-18); Decatur, Ill. (1911-29); Orange, Texas (1912-28); New Orleans, La. (1918-31); and of the kraft paper mill at Braithwaite, La. (1915-31).

Of the approximately two hundred twenty-five tons of paper produced daily, forty per cent goes into wrapping sheets and rolls, and the other sixty per cent into about eleven million bags each day.

Late in 1938, H. E. Westervelt, president and founder of the corporation, died at the age of eighty. His vision, ability, patience and faith guided the destiny of the company until the $769.00 invested in 1885, grew into the present modern, debt free, progressive enterprise.

He was succeeded, as president, by his daughter, Mildred Westervelt Warner (Mrs. H. D. Warner). F. M. Dickinson remains vice-president in charge of sales, while Mr. H. D. Warner is secretary-treasurer. Other active vice-presidents are W. E. Penfield, manufacturing, and H. H. Yoder, industrial relations. Frank Brewer has retired, but remains one of the directors. W. P. Thielens is also a director.



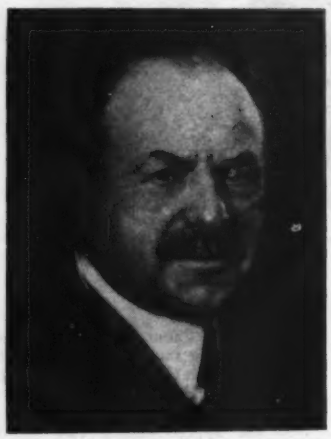
Gulf States Paper Co., Tuscaloosa, Ala.

Hammermill Paper Co., Erie, Pa.

Hammermill Paper Company, Erie, Pa., pioneered in the manufacture of fine papers from fibers produced by the sulphite process.

The firm was founded in 1898 by two brothers, the late Mr. Ernst R. Behrend and Dr. Otto F. Behrend, in association with their father, Mr. Moritz Behrend. Mr. Ernst Behrend was president of the company until his death, September 22, 1940; Doctor Behrend is still active as treasurer. These men introduced new methods and new equipment to American papermaking.

Erie was chosen as the site of the new mill for several reasons. First, because of the cheap water transportation from the pulpwood forests of the St. Lawrence and Great Lakes areas; also, because of the unlimited supply of fresh water available in Lake Erie, the nearness of the Pennsylvania coal fields, and the city's excellent railroad facilities for overnight deliveries to the nation's largest markets. Besides, Erie offered good living conditions for workmen and their families.



ERNST R. BEHREND

N. W. WILSON

Originally Hammermill had one paper machine and about 200 employees. An immediate acceptance of the mill's products afforded a steady growth, so that in 1912 five machines were in operation. In those early years, paper was made with private watermarks for each customer, and at one time more than 200 different brands were being made.

In 1912 Hammermill Bond was introduced and was given the backing of national advertising. In a short time it replaced the private brands that had been made up to then.

Sold through a system of independent paper merchants, the new paper found an ever expanding market. Additional mill lines took their place beside Hammermill Bond until today there are a score of grades carrying the Hammermill name—papers for almost every business and advertising use.

Early in 1940 the sixth paper machine was added. In Erie the company now employs nearly 1500 men and women, and it occupies more than 200 acres of plant and wood storage space.

During all these years, the policies of Hammermill's founders have been far-seeing, and have made for excellent relationships between management and employees. This mill was one of the first organizations in the country to install a profit-sharing system and to grant hourly workers vacations with pay. Today one out of four of its workers are veterans with twenty years or more of service; many sons are following in their father's footsteps in Hammermill employ.

Thus, while its products have earned an international reputation for their excellence, Hammermill has also become known as a good place to work.

The following is a partial list of Hammermill Papers:—

Hammermill Bond, Hammermill Bristol, Hammermill Cover, Hammermill De Luxe Cover, Dura-glo Hammermill Cover, Hammermill Manuscript Cover, Hammermill Duplicator, Hammermill Ledger, Hammermill Mimeo-Bond, Hammermill Offset, Hammermill Opaque, Hammermill Posting, Hammermill Safety, Management Bond and Whippet Bond.

The present officials of the Hammermill Paper Company are as follows: N. W. Wilson, president and general manager; Dr. O. F. Behrend, treasurer; D. S. Leslie, first vice president and assistant general manager; W. T. Brust, vice president and assistant treasurer; W. F. Bromley, secretary; H. F. Obermanns, vice president in charge of manufacturing; H. R. Baldwin, vice president in charge of sales; M. Harrison, vice president in charge of industrial relations; F. P. Klund, assistant secretary and advisory engineer; A. E. Frampton, assistant secretary, advertising manager, and assistant general sales manager.

PLANT OF HAMMERMILL PAPER CO., ERIE, PA.

Hinde & Dauch Paper Co., Sandusky, Ohio

The Hinde & Dauch Paper Company was established in 1882 at Sandusky, Ohio. The founders, whose names still continue in the corporate title, were James J. Hinde and Jacob J. Dauch. Pooling their slender resources, a partnership was formed and the young men started in business with a threshing machine and a straw baler. Their chief assets were their reputations for honesty and hard work, rather than in plant and equipment which had a value of only a few hundred dollars. One of them had taught at a business school and the other partner was a deck hand on a lake boat.

One of the customers of Hinde & Dauch was the Sandusky Paper Mill, a small concern which manufactured the old-fashioned straw wrapping paper used by butchers. The mill closed down in 1887 because of financial difficulties. Hinde & Dauch leased the mill from the bank owner for $25 a month. Later they bought it with borrowed capital for $2,500. There was such a limited demand for straw paper that the profits of Hinde & Dauch were often so meagre that the two partners were able to take home $10 a week or less.

Corrugated paper, on which the original patents had expired, attracted them. Through experimentation they developed a wrapper for protecting lamp chimneys, glass jars and bottles. Their new product, known as "Climax Wrapper," was a corrugated paper tube. It proved cleaner, lighter in weight and much easier to use than the cut straw wrappers of that period. The "Climax Wrapper" put enterprise in the packaging business and was one of the forerunners of the thousand-and-one different paper items manufactured at the present time.

The Hinde & Dauch partnership was not content, however, in developing merely an excellent product but they also successfully merchandised it. Their efforts provided the impetus which started the upward trend in sales and earnings which has continued to the present day.

A good business had been built in 1909 in a new patented wrapper, in straw paper and other miscellaneous items, such as bolster rolls, a popular article of that day for decorating beds. Annual sales in that year rose to $1,000,000. But corrugated paper boxes for freight shipments, now the most important product of the Hinde & Dauch Paper Company, had not been developed.

An enterprising young salesman is believed to have suggested the first corrugated paper shipping boxes the company manufactured. This salesman sold a Buffalo cereal company the idea that paper boxes would be suitable for shipping its products and he succeeded in getting an order for two carloads of paper boxes. When the order was received at the home office in Sandusky, Mr. Hinde, who was president, said corrugated paper boxes would not carry heavy freight. It was a revolutionary idea. But the Hinde & Dauch company made experiments and at length produced a box that not only met all shipping requirements but proved even more successful than the salesman had thought possible.

Sidney Frohman, the present head of the company was hired as treasurer in 1910. He was well grounded in the paper industry when he joined the Hinde & Dauch Paper Company. As a salesman and director of the Sandusky Foundry and Machine Company, specialists in paper making machinery, he had visited paper manufacturing plants throughout the country for over seven years. This experience gave him a knowledge of both production and sales. Prior to that he worked for a short time as a street car conductor and later as freight agent and secretary to the general manager of the former Lake Shore Electric Railway Company. Undoubtedly this early training impressed him with the importance of transportation as a cost of doing business and as a factor in prompt deliveries.

In the first year of Mr. Frohman's connection with the Hinde & Dauch Paper Company, the policy was adopted of locating manufacturing plants near large industrial centers to facilitate prompt deliveries and to keep costs down. This practice has resulted in a reduction in delivery time for orders from 60 days or more a few years ago, to a matter of hours today. It was during this first year of Sidney Frohman's connection that the company established a Canadian plant. Although prompt deliveries have aided the company, no one policy has been responsible for the company's success. Rather, it has been achieved because Mr. Frohman has been able to coordinate all departments of the business.

To meet the growing demand for its products, the Hinde & Dauch Paper Company has expanded its manufacturing facilities until it operates 16 box plants and 10 paper mills, extending from the Atlantic Seaboard as far west as Kansas, to North Carolina in the south, and north to Montreal. When possible the company has added to its capacity through the acquisition of established plants. Most of the higher positions in the company are filled by employees who have come up through the ranks. The present officers are: president and general manager, Sidney Frohman; vice-president, mill division, J. W. Harbrecht; secretary-treasurer, W. F. Pfeiffer.

The Hinde & Dauch Paper Company continue to spend much time and money in the maintenance of its "package laboratories." They have expanded from the single "sample room" at Sandusky, until one is maintained in connection with each of the company's larger plants. Thus, the company develops many types and styles of packaging specialties. Research has also led into the printing and coloring fields, resulting in a widely known line of display containers. The company has also developed and patented insulating material of corrugated paper for automobiles, refrigerators and building construction and solid fiber boxes have been made at two plants.

Hollingsworth & Whitney Co., Boston, Mass.

The Hollingsworth & Whitney Co., was established on April 5, 1862, at Boston, Mass. Ellis A. Hollingsworth and Leonard Whitney Jr. formed the partnership of Hollingsworth and Whitney, for the manufacture of paper and paper bags. Mr. Whitney had been operating a paper mill and bag factory at Watertown and Mr. Hollingsworth had operated a paper mill at South Braintree, Mass.

Ellis A. Hollingsworth was a son of Mark Hollingsworth who had a paper mill on the Neponset River below Mattapan, near Boston, as early as 1801. Another son, Lyman Hollingsworth, discovered an improved method for the manufacture of a strong paper by the utilization of waste rope in the manufacturing process. This improved process was mothered by necessity, for Mr. Hollingsworth being faced with a shortage of stock after the panic of 1837 tried the experiment of cutting the bolt ropes off some old sails lying in the mill yard and using this material in the manufacture of paper. The result was a fine manila paper of great strength and good quality. The patent for this discovery was granted to John M. Hollingsworth and Lyman Hollingsworth in the year 1843.

HOLLINGSWORTH & WHITNEY CO., WINSLOW, ME.

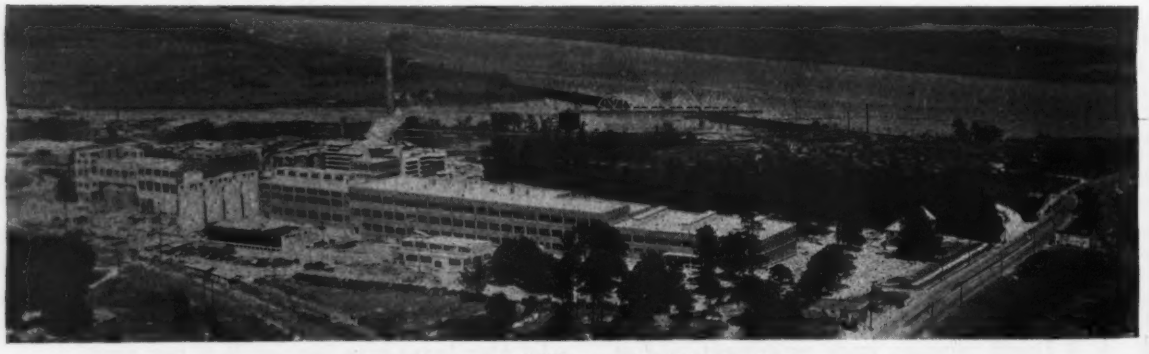
Charles A. Dean became associated with the company in 1874 as sales manager, and in 1876 a mill was purchased at Gardiner, Maine, which was to be the site of continuous operation from that date until 1939.

On April first 1882, following the death of both partners, the business was incorporated as Hollingsworth & Whitney Company, with Sumner Hollingsworth as the first president. In this year Charles A. Dean became vice-president and general manager. Under his management, the growth of Hollingsworth & Whitney Company was outstanding. The tonnage of paper produced increased from 2,705 tons in 1882-1883 to 54,000 tons in 1911, the year of Mr. Dean's retirement, while in the same period the capital stock increased from $500,000 to $5,000,000.

Construction was started on the company's large mills at Winslow, Maine, in 1891. Here were built paper and pulp mills. The capacity of this unit was increased under Mr. Dean's direction and that of his successors, W. E. Pratt and M. L. Madden, to a point where 300 tons of paper are produced per day on six paper machines, and the daily production of sulphite pulp is 190 tons. The bleach plant has a capacity of 50 tons per day. In 1908 groundwood mill was built at Madison, Maine, with a capacity of 100 tons per day.

The company's new Chickasaw Mills at Mobile, Ala., include a pulp mill, pulp - drying machine, bleach plant, Fourdrinier paper machine and cylinder paper machine, and all necessary equipment. The plant is designed to produce approximately 200 tons of sulphate pulp, bleached and unbleached. The paper machine capacity is approximately 160 tons. The balance of the pulp will be dried for shipment. The Hollingsworth & Whitney Co. now produces all the pulp required for its mills, and thus rounds out a program of sound expansion. The main office is at Boston, Mass.

The officers of Hollingsworth & Whitney Company are: M. L. Madden, president; W. B. Merlin, vice-president; H. C. Thayer, treasurer; and Robert Nivison, manager of mills.



HOLLINGSWORTH & WHITNEY CO., MOBILE, ALA.

Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.

The Kalamazoo Vegetable Parchment Co. was established at Kalamazoo, Mich., in 1909. This mill got its start because Jacob Kindleberger, a young salesman for the West Carrollton Parchment Company, foresaw the increased need for and use of special papers for the protection of foods. Coming to Kalamazoo in the fall of that year he, with his brother-in-law, Harry Zimmerman, organized a company to convert waterleaf into genuine vegetable parchment. J. J. Knight, an influential Kalamazoo capitalist, subscribed the first $10,000 and with his name heading the list, the remainder of the original $50,000 capital was quickly taken up. The first paper was delivered April 5, 1910. Capitalization is now $5,000,000 all of which is in common stock. There is no bonded indebtedness.

Genuine vegetable parchment has always been the backbone of the business, but companion papers, many of them originating with KVP, have been added through the years to round out a complete food protection line. The first of these was waxed paper, waxing equipment being added the second year of operation.

KALAMAZOO VEGETABLE PARCHMENT CO.

By 1916 the business had increased to an extent that it became necessary to build a two-machine paper mill to assure raw stock requirements. The machines were a 116-inch Horne Harper and a 164-inch Pusey & Jones.

Further converting requirements caused the construction of a second paper mill in 1922 and a line of bond papers was also added. A 165-inch Bagley & Sewall machine, designed to run nearly twice as fast as any previously existing paper machine on comparable papers, was installed. In 1928, a 166-inch Beloit was installed beside it. Mill No. 3, with a 138 Bagley machine and Yankee dryer was started up in 1937. A sizeable bleach plant handles most of the company's bleach requirements. Paper machine capacity is approximately 430,000 pounds in 24 hours.

Paralleling this growth and in fact the reason for the paper mill expansion, has been the extensive converting operations of parchmentizing, waxing, printing, ruling, laminating, and special treating. Allied operations include plate and ink making. About 1500 people are employed in these numerous operations. Converting plants are operated in Philadelphia, Pa. and Houston, Texas. Sales offices are maintained in Boston, New York, Baltimore, Philadelphia, Detroit, Chicago, Houston, Minneapolis and San Francisco.

The present officers of the company include J. Kindleberger, founder and chairman of the board; R. A. Hayward, who came with the company as general manager in 1924 and has been president since 1936; C. S. Campbell, treasurer since the company was founded; Alfred Southon, 1st vice-president, in charge of sales, an employee since 1910; James A. Greenlee of the Chicago office, 2nd vice-president; H. H. Jones, 3rd vice-president and sales promotion manager; T. W. Peck, secretary; Wm. Hess, assistant secretary. Directors include: C. S. Campbell, A. B. Connable, L. H. S. DeWitt, R. A. Hayward, W. E. Kidder, J. Kindleberger, W. J. Lawrence, F. Mosteller, A. B. Read, A. Southon and C. H. Stearns.

KVP is essentially a specialty mill. Its chief products are parchment, waxed, greaseproof, oiled and laminated papers. Nearly every one of these is built to special specifications for the particular protection problem involved. The chief industries served by these papers include meat packing and poultry, dairy, vegetables, fish, baking, cereal, retail meats, and soap. Other lines include bond, mimeograph, writing, manifold, shelf, waxed, dusting, cookery parchment and pie tapes for the home. Other items include adding machine rolls, envelope and offset.

J. KINDLEBERGER R. A. HAYWARD ALFRED SOUTHON

Kimberly-Clark Corp., Neenah, Wis.

The Kimberly-Clark Corporation was established at Neenah, Wis., in 1872. In March of that year four far seeing pioneers, J. A. Kimberly, H. Babcock, F. C. Shattuck, and C. B. Clark, undertook what was then considered a wild venture, broke ground and erected the Globe Mill, the first paper mill in the state of Wisconsin fitted to make print and book papers entirely from rags. This mill was started on October 22, 1872, making its first sheet of rag print and glorying in making about two tons of paper a day on a 72 inch single cylinder machine.

Since then much water has gone under the bridge and the "wild venture" of 1872 has developed into a vigorous industrial enterprise. For the first thirty-five years the organization progressed first, as a partnership, then as a corporate entity with the stock closely held within the families of the four original partners. During its sixty-eight years Kimberly-Clark has had but two presidents—J. A. Kimberly from 1872 until his death in 1928 and subsequently F. J. Sensenbrenner. In 1907 a reorganization took place in which Mr. Sensenbrenner became a major stockholder. Other leaders in the business at that time obtained a stock interest. By 1928 the organization had grown to a point where it seemed advisable to again reconstruct its capital structure and at this time Kimberly-Clark became a public company under the corporate tital "Kimberly-Clark Corporation." The general offices have remained at Neenah since 1872.

Over the years the company has constructed and reconstructed plants in Neenah, Appleton, Kimberly, Niagara, Wis. and Niagara Falls, N. Y. Extensive timber holdings were acquired in Minnesota and in the Gogebic Lake district of northern Michigan. In 1920 they acquired valuable water power and timber rights at Kapuskasing, Ontario, approximately 450 miles northwest of Toronto. This Canadian venture, in company with the New York Times, known as the Spruce Falls Power and Paper Company, Inc., eventuated in a modern hydro-electric development, groundwood and sulphite mills and a paper mill capable of producing 600 tons of newsprint per day.

Hyfect and Kleerfect for rotogravure printing and general publications, also a large tonnage of light weight papers for catalog use, are produced at Kimberly, Wis. These papers are especially adapted to fast press runs. The Niagara, Wisconsin, plant turns out 100 tons of paper daily for publications, mail order catalogs, and the rotogravure sections of large newspapers.

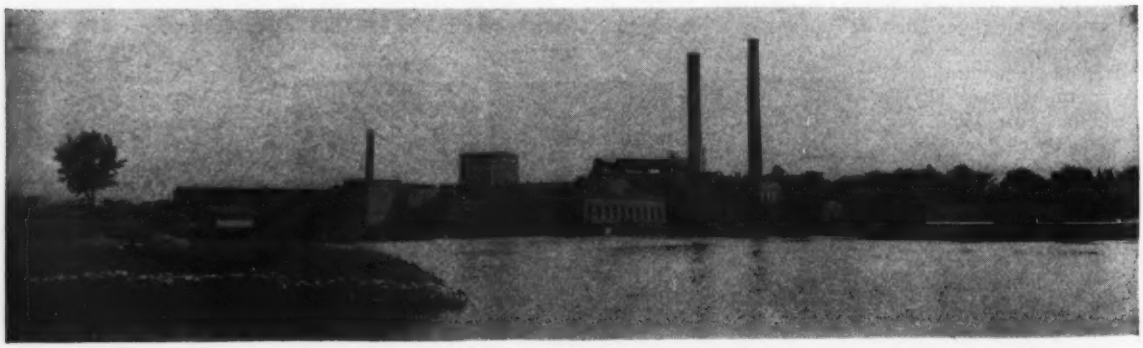
At the Badger-Globe and Lakeview Mills in Neenah, crepe wadding products in the form of sanitary pads, facial tissues, handkerchiefs and hospital wadding are manufactured for International Cellucotton Products Company exclusively, and sold by that company under the well known trade names Kotex, Kleenex, Delsey, etc. The Lakeview Mill also produces specialty papers such as cover stock, school papers, fancy box covers, ticket stock, etc., in addition to raw stock for the wall paper which is printed at the Atlas Mill, Appleton.

F. J. Sensenbrenner

During the past year there has been under construction at Neenah a unit to house one of the newer Kimberly-Clark products, KIMSUL, a material designed to insulate against sound and temperature. The plant at Niagara Falls, New York, contributes to the company's growing trade in crepe wadding products, such as Kotex, Kleenex, Kimpak, Sanek, etc., and, in addition produces approximately 135 tons of rotogravure papers per day.

The management of the business foresaw some years ago that to sustain their projected program of growth and expansion a progressive personnel program would be advisable and there have, accordingly, been incorporated into the routine of the business many features, any one of which would form the basis for a human interest story.

Many hundred employees take advantage of the annual health examinations that may be had at company expense. Through the Mutual Benefit Association the 4667 members receive assistance in paying hospital and surgical bills, dental work and bills of oculists, etc. to the amount of $60,000 annually. 5206 individuals in the group life insurance program with $9,536,500 of coverage. Neither company nor employees would be without their job evaluation and merit rating program. A vigorous year round safety program is promoted in all plants of the corporation. And last but not least is a community relations program designed to cultivate and consolidate understanding between the industry and the several communities in which the corporation's plants are located.



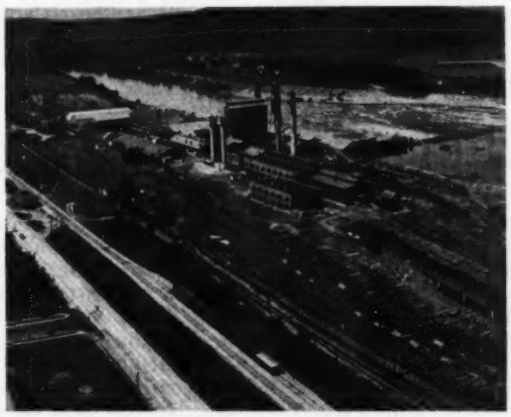
Kimberly Mill of the Kimberly-Clark Corp.

Marathon Paper Mills Co., Rothschild, Wis.

The Marathon Paper Mills Company was established on February 13, 1909, at Menasha, Wis. The original capitalization consisted of 7,500 shares of common stock at $100 per share par value. A decision to build a paper mill was reached by a group of local residents who had originally organized the Rothschild Water Power Company, to deal in real estate, buy and sell logs and timber, developing water power, etc. The decision was necessary because the State of Wisconsin had decreed that all the holders of water power rights must develop water power within a year, or lose their franchise. Original subscribers to the stock of the Marathon Paper Mills Company consisted of:

John D. Ross, E. W. Brooks, Chas. J. Winton, Brooks & Ross Lumber Company, G. D. Jones, Walter Alexander, Alexander Stewart, C. C. Yawkey, B. F. Wilson, W. H. Bissell, Wausau Law and Land Association, Jacob Mortenson, and the Mathie Bros. Land Company, all of which were in the Rothschild Water Power Company and, in addition, Neal Brown, C. S. Gilbert, Karl Mathie, F. P. Stone, Louis Dessert, J. A. Porter, M. C. Ewing, R. M. Heskett, W. L. Edmonds, H. C. Stewart, W. H. Yawkey and D. C. Everest.

The first organization in direct charge of operations was composed of D. C. Everest, general manager; E. B. Garrison, assistant manager; A. M. Van Douser, auditor; John Daley, paper mill superintendent, and Albert Hinzke, sulphite and groundwood mill superintendent. The construction on a dam to furnish power for the concern was started in May 1909, and construction on the buildings in July of the same year. A little later several houses were built for the employees on a hill northeast of the mill. This was the beginning of what is now known as Rothschild.



Marathon Paper Mills Co.

On November 18, 1910, the first machine of the three installed started making paper; the second one on December 1, 1910, and the third on January 2, 1911. These three machines consisted of a Cylinder, a Fourdrinier and a Yankee machine, with the latter being the largest of its kind in the world at the time. On February 5, 1910, the capital stock was increased to 10,000 shares of common at $100 par value each.

On October 5, 1911 an almost disastrous flood occurred. At Wausau there were about 10,000,000 feet of logs stored which were quickly swept away and carried down to Rothschild. The boiler house was undermined. Supplies in the basement were ruined and the generators in the power house were so damaged that they could not be operated. Shortly after, it was necessary to issue 6000 shares of 6 per cent preferred stock with cumulative dividends and participating equally with common in any and all dividends declared on common stock. This was done to help rebuild the dam and the damaged mill.

Some time was required to put the mill in operation. Then, on July 24, 1912, only a few months after paper was again being manufactured, there was another flood. This time it was necessary to dynamite the coffer dam, constructed in order that the original dam could be rebuilt, to release the water pressure. Supplies were again damaged, generators were ruined and things looked very serious.

In 1916 another Yankee machine was added to take advantage of a boom in the demand for light, watermarked, wrapping papers. This machine was later converted to a Fourdrinier type in 1922. Another development in 1916 was that of a bleached lined board which was sold to a young company in Menasha for packaging butter. This product was new on the market and marked the first use of a quality board in food packaging. It was a hard product at $100 a ton; whereas the regular board was priced at $40 a ton. Management thought that it was the coming thing in food packaging and management was right. The company to which the new board was sold was the Menasha Carton Company and eleven years later this company was added to the organization.

On November 18, 1920, the capital stock was increased to $4,000,000 consisting of 34,000 shares of common and 6000 shares of preferred stock, both of which were at $100 par value. On October 10, 1927, another increase in capitalization took place to the extent of issuing an additional 10,000 shares of common stock for the purpose of purchasing the Menasha Printing and Carton Company of Menasha. On November 1, of the same year, this merger was consummated.

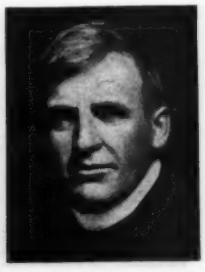
A brief resume of the history of the Menasha company also shows an interesting development. A former newspaper man, Sam Clinedinst, came to Menasha, Wis., in 1900, and set up an antiquated printing press on the third floor of a paper mill. By 1904, however, he was able to incorporate as the Menasha Printing Company and by 1912 had added a paper mill.

George S. Gaylord also was confronted with many obstacles when he organized the Menasha Carton Company in 1912 to make butter and cheese cartons. The year 1916 was an important one for both men. In that year Gaylord began to buy board from the Marathon Paper Mills Company and make high grade cartons. It was during the same year that waxed paper business began to grow because of the legislation in various states, making waxed paper wrappers compulsory in the bakery business.

Both of these Menasha companies were operating in the food packaging field and it appeared that a merger would be desirable, so in 1917 the two companies formed

C. C. Yawkey

D. C. Everest



Neal Brown

the Menasha Printing and Carton Company. The relationship between Menasha and Marathon became so close that a consolidation was consummated in 1927.

On September 24, 1929, the entire capital structure of the Marathon Paper Mills Company was changed. The cumulative and participating preferred stock was retired and in the place of each share of old preferred, one share of new non-participating preferred and four shares of new $25 par value common stock were issued. All of the old common stock was changed to four shares of $25 par value for each share of $100 par value stock.

On October 20, 1937, a dividend on common stock was paid in preferred stock. The present capital stock consists of 200,000 shares of $25 par value common stock and 12,000 shares of $100 par value preferred stock, which totals $6,200,000. At the present time the book value of the company totals some $13,000,000 and since the acquisition of the Menasha Printing and Carton Company in 1927, the company has added a converting plant in Milwaukee, a sawmill in Ironwood and cutting rights for timber in Canada. Two objectives in obtaining Canadian cutting rights were to secure a long time supply of spruce wood for the Rothschild pulp mill and also to secure a cheap and continuous supply of high grade wood from which to secure the highest grade of bleached sulphate pulp possible to produce from a pulp mill to be built within the Province of Ontario and on Lake Superior. This district is noted for its purity of water and is so situated that it insured cheap transportation costs to the Rothschild, Menasha and Ashland plants and also will provide a high grade bleached sulphate pulp for the Central West pulp market on a comparatively low delivered cost.

At the annual meeting of stockholders on December 19, 1938, the number of directors was changed from nine to eleven. The following officers and directors were elected:

C. C. Yawkey, chairman of the board; D. C. Everest, president and general manager; Leo E. Croy, vice-president; John Stevens, Jr., vice-president; P. M. Wilson, secretary and treasurer; Ben Alexander; Lester Armour; L. F. V. Drake; C. S. Gilbert; M. P. McCullough and C. J. Winton, Jr.

Credit for the development of the company has been due to the far-sightedness of its executives and directors in developing a diversity of products and maintaining research departments to develop new products.

Chillicothe Paper Co.

The Chillicothe Paper Company, Chillicothe, Ohio, was incorporated under the laws of Ohio in June 1919; the original officers being:

Hector McVicker, president and general manager; George Litter, vice-president; Austin P. Story, treasurer; Lyle S. Evans, secretary; Edwin F. Bearce, chief engineer.

The original mill, which started in May of 1920, consisted of one Fourdrinier machine, with a trim of 144 inches, and all the necessary auxiliary equipment, including power plant.

The mill which was built for making high grade uncoated book papers started up on newsprint, which was sold at prices ranging from 8 cents a pound to 11 cents a pound, because that was just at the time of the most abnormal demand for paper, and the sales department now looks back with longing eyes at those days, and wishes it could now have just a little bit of the same experience.

After the slump of 1921, the company started on its successful march to gain its reputation for high quality papers, and with increasing demand, it was necessary to add a second larger paper machine, which started operations in March of 1928. This machine has a trim of 144 inches, and gave the mill an annual capacity of twenty-one -thou sand tons.

Early in its history The Chillicothe Paper Company turned to the making of paper for the offset printer, as somewhat of a specialty, and has kept up with the steady growth in this type of printing, and with the technical advances necessary in making this type of paper. In 1936, a complete system of moisture and humidity control was installed in the mill. This included controls on the paper machines, to regulate the moisture in the paper, and the building of one of the first completely conditioned finishing rooms. This careful control of moisture and humidity has made it possible for most of the users of the Offset paper purchased from this mill, to print the paper directly from skids or cases, without hanging or further conditioning in the printer's plant.

Adena Offset is the leading brand of paper made by this mill, and recently they have developed a new paper called "Halftone Offset Dull" and "Halftone Offset Gloss," which gives the lithographer papers with characteristics between those of coated Offset and standard type of Offset paper. The equipment includes pasting machine, several embossing machines, a gravure and aniline printing machine, which are used for special papers, such as are used for greeting cards, high grade papeteries, duplex envelopes, box wraps and other specialties.

The present officers of the Company are: Hector McVicker, president and general manager; Edwin F. Bearce, vice-president; Austin P. Story, vice-president and treasurer; Lyle S. Evans, secretary; A. I. Cahill, sales manager; F. L. Zellers, general superintendent; Russell McVicker, purchasing agent.

HECTOR MCVICKER

EDWIN F. BEARCE

AUSTIN P. STOREY

The Marvellum Co., Holyoke, Mass.

In 1921 The Marvellum Company was established in Holyoke, Mass., by George Senseney, Russell Bracewell and Francis C. Heywood to produce an original concept of decorated papers.

While the old order remains properly stabilized and often reasonably prosperous it is the creative, the wholly new, the inspirational spirit of a mill by which it is able to move bravely forward during otherwise static times.

The history of Marvellum is the story of invention—all the way from creation of a wholly original process to the conception and then the designing and building of specialized machinery by which the idea might become a manufactured product; it is the marbling papers spreeing in an orgy of fantastic color harmonies; it is the deft spotting and blending of colors from the artist's brush reproduced by machine just as the full rich ever-varying tones of a great violinist come from the phonograph disc.

Artist—Chemist—Engineer

First there had to be the artist, then the blending of artist and chemist and third the union of those two with the skilled visionary engineer.

The artist is George Senseney, pupil of Jean Paul Laurens and Benjamin Constant in Paris; member of the Societe des Graveurs; Salmagundi Club; Society of Etchers and a former Instructor of Design at Smith College, Northampton, Massachusetts. While working in his studio at Northampton, Artist Senseney developed the basic idea of coagulating silver and gold liquid bronzes with a whole spectrum of brilliant combining colors to produce a new decorated paper.

The chemist, Russell Bracewell, became associated with Artist Senseney while he, Bracewell, was engaged in chemical research at one of the major Holyoke paper mills. Together, artist and chemist worked out a hand process by which each individual sheet was decorated with indigo, coral, red, jade, gilt and other exotic tones but it was slow work and limited in output.

That is where the engineer, Francis C. Heywood, joined forces with artist and chemist and together they created a machine capable of duplicating the hand work; a machine so versatile that rolls of paper could be decorated with a constantly varying pattern of color.

New Plant Occupied

It was nineteen years ago, in the year 1912, that these three established The Marvellum Company in Holyoke, Massachusetts. By the middle of 1922 the new machinery was developed to the point where decorated papers were being produced in commercial quantities in a five thousand square foot plant which was outgrown almost immediately and new plant facilities with approximately 35,000 square feet occupied. Much of the early production was of envelope lining papers, greeting card papers and decorated technical paper for radio cone speakers.

By 1928 the business had expanded far beyond the capacity of the second plant and Marvellum acquired the building and machinery of the Whitmore Manufacturing Company in Holyoke, which—with the addition of the equipment from the former plant—expanded the variety of decorative specialties and provided facilities for adding a surface coating department.

The recent history of The Marvellum Company has kept the pace of the rapid development of its early history. To the equipment which was taken over when the Whitmore was purchased has been added much specialty coating and embossing equipment for producing the beautiful fancy papers and cover stocks which are synonymous with the name "Marvellum".

Sales Impetus

The development and expansion of products required an aggressive and experienced sales personnel. William J. Warner, for many years one of the leading sales executives of the paper industry, joined the young company as Vice President and Sales Manager.

As the business grew, Maurice A. Park, long experienced in the specialty and cover paper markets joined The Marvellum Company to supervise the Cover and Specialties Department and Paul L. Houston became manager of the Box Covering and Fancy Paper Department.

The growth of this company through the depression years necessitated greatly enlarged sales offices; a new Order and Traffic Department, with Theodore Main joining the organization as its Manager; the expansion of its research and control laboratory under Carroll Enemark, its Chief Chemist. An up-to-the-minute hospital, fully equipped has been recently completed. Everything has been done to insure the high quality for which the mill is noted.

GEORGE SENSENEY RUSSELL BRACEWELL FRANCIS HEYWOOD

The Keynote

The keynote of Marvellum production is expressed in the byline "Papers Distinctive."

The Mead Corp., Chillicothe, Ohio

The Mead Corporation of today is the direct outgrowth of two of the earliest established paper mills in the middle west. For three generations the Mead family has been identified with the paper-making industry of Ohio and the story of progress of "Mead Papers" is a business romance, built around the struggles of the industrial pioneers of the Miami and Ohio valleys.

More than ninety years ago Daniel E. Mead, in company with several business associates, organized the firm of Ellis, Clafflin & Company, for the purpose of manufacturing book and other printing papers in Dayton, Ohio. In 1881 D. E. Mead obtained full ownership and adopted the name of the Mead Paper Company and in 1885 he purchased the Chillicothe Paper and Pulp mill.

The business thus founded in 1846 was continued as a privately owned company for the next sixty years. In 1905 it was found necessary to begin enlarging the company in order to establish a proper position in the industry and shortly thereafter, the Mead Pulp and Paper Company was incorporated under the laws of Ohio. In 1907 the equipment of the original Dayton plant was moved to Chillicothe.

Largely due to the technical knowledge of Geo. H. Mead, a graduate of the Massachusetts Institute of Technology, and from practical knowledge, having worked in his grandfather's mill, the growth of the corporation was rapid, though constructive and aggressive. The Chillicothe plant alone soon developed into one of the two largest in Ohio manufacturing paper.

The present Mead Corporation was formed in 1930 and today has grown into a far-reaching institution, embracing twelve divisions and subsidiaries for the manufacture of pulp, paper, paper-board and chestnut extract for tanning with plants located in seven states. Employment is furnished to approximately 4,100 people.

In 1932 the Corporation took over the management of the Dill & Collins plant in Philadelphia, Pa. This mill traces its early history to the first paper mill in America which was established in 1690 by William Rittenhouse. This year is being celebrated as the 250th anniversary of the Rittenhouse mill.

In 1933 the Corporation acquired the Wheelwright plant in North Leominster, Massachusetts. This mill was leased in 1858 by George W. Wheelwright, who in 1863, purchased the mill and is said to have discovered the possibility of using old printed papers for manufacturing into fresh paper to take the place of rags. It was in the Wheelwright mill in 1880 that the first manufacture of mill bristols in America was instituted.

The Brunswick Pulp and Paper Company organized jointly by The Mead Corporation and Scott Paper Company of Chester, Pennsylvania, was completed in 1938 for the production of bleached sulphate pulp, and the same year the St. Joe Paper Company was organized jointly by The Mead Corporation and Almours Securities, Inc., of Jacksonville, Florida, for the production of kraft liner board. The Corporation disposed of its holdings in the St. Joe Paper Company in 1940.

The paper products of The Mead Corporation are highly diversified. "White Papers" are manufactured at the modern mills in Chillicothe, Kingsport, North Leominster and at the Dill & Collins plant in Philadelphia. The four plants have a combined annual capacity of approximately 185,000 tons of finished paper.

A considerable portion of the white paper produced is regularly used by publishers of nationally known magazines, including the Woman's Home Companion, American Magazine, Colliers Weekly, McCall Magazine, Time and Life magazines and News Week.

White papers other than magazine papers, include book and lithographic grades used in the printing and publishing field, bond and writing papers, printing and index bristols used for general advertising and business purposes and cardboards used for display advertising. Of equal importance is a complete range of standardized coated and uncoated papers used principally for high-grade catalog and commercial printing, also many specialty grades of converting paper including label, envelope, and waxing papers.

Brown Papers are made in the paper-board plants of the Corporation, located in North Carolina, Virginia and Tennessee, which have a combined annual capacity of approximately 130,000 tons of chestnut corrugating boards and liner boards. The Corporation is one of the largest manufacturers in the United States of chestnut-wood extract and bark extracts, used for tanning leather. The extract manufacturing plants are located in North Carolina, Virginia and Tennesse and have a combined capacity of approximately 290,000 barrels.

The paper products of the Corporation are distributed both directly and through Sales Agencies and its mill brand papers are sold through 180 recognized merchant distributing houses in 38 states. The Mead Sales Company, formed in 1921, is engaged in the sale, advertising and promotion of the paper, board and pulp produced by Mead and other mills. Sales offices are located in New York City, Dayton, Ohio, Chicago, Illinois and sales representatives are also located in Philadelphia, Boston, Kingsport and San Francisco. Today the keynote of the widespread Mead organization is "Paper Makers to America."

PLANT OF THE MEAD CORP. AT CHILLICOTHE, OHIO

Miamisburg Paper Co., Miamisburg, Ohio

The Miamisburg Paper Company, known originally as the Miami Valley Paper Company, was established in 1871 by Captain Emanuel Shultz who built the mill at Miamisburg, Ohio, in the heart of the Miami Valley. Construction of the original buildings begun in July, 1871, was completed in November of that year and the first paper came over the machine on January 17, 1872.

One Fourdrinier had been installed and it was used exclusively for the making of book paper out of rags.

Captain Shultz, a capitalist in his day, had interested his son-in-law, Dr. William H. Manning, in the venture and he it was who had complete charge of operations when Captain Shultz was elected to Congress about 1880. Dr. Manning retired from the business a short time after Captain Shultz returned from Washington and soon afterwards, in 1890, the mill was sold to J. H. Friend who was President of The George H. Friend Paper and Tablet Company of West Carrollton, Ohio.

CARLTON W. SMITH

HARLEY L. WERTH

The original Fourdrinier machine was then used to make newsprint, butcher's manila and No. 2 manila, and wood pulp was used thereafter instead of rags.

The mill and practically all the equipment was destroyed by fire in 1893. It was promptly rebuilt and this time a cylinder machine was installed. The principal product marketed was mill wrappers and papers used in the making of containers such as oyster and berry buckets.

On October 24, 1894, the company was incorporated under the laws of Ohio as the Miamisburg Paper Company with J. H. Friend as President and Treasurer and R. W. Burns as Vice-President and Secretary.

The mill site was then purchased by the Miamisburg Paper Company from the George H. Friend Paper and Tablet Company.

A short time thereafter the cylinder machine was removed and two Fourdriniers installed. These were used for the making of butcher's manila, No. 2 manila, cash register and detail paper, and colored cover paper. A super-calender was installed for the supering of the colored cover.

In 1906 the mill was purchased by the American Envelope Company of West Carrollton, Ohio. For a while one machine was used to make manila, cash register paper and colored news and the other machine was used in the production of envelope paper. The super-calender was used for the supering of the envelope paper.

In 1920 the two machines were abandoned and a larger machine installed. The present equipment consists of one 128 inch Fourdrinier which trims 118 inches, three beating and two refining engines. Water and electric power is used and the present capacity is approximately 70,000 pounds in twenty-four hours.

The company continued to operatae as a subsidiary of the American Envelope Company until January 2, 1940 when it was dissolved as a separate corporation and is now operating as the Miamisburg Paper Company Division of the American Envelope Company. The present officers and members of the board of directors are: Carlton W. Smith, President and Treasurer; Albert E. Smith, First Vice-President and Sales Manager; Horace C. Tracy, Second Vice-President; Raymond P. Bertschy, Secretary, and Harley L. Werth, Assistant Secretary.

MIAMISBURG PAPER COMPANY MILL

Nashua Gummed & Coated Paper Co.

The Nashua Gummed and Coated Paper Company was incorporated in 1904, one of its founders being James R. Carter, who was also the founder of Carter, Rice & Co., of Boston. The historical background of the Company goes back, however, to 1848 from which time until 1904 several coating concerns operated in Nashua and merged from time to time until the present company's immediate predecessor, the Nashua Card and Glazed Paper Company, sold out to it, its plant and business. The earliest of these older companies, Gill Murray and Gage, began in 1848 to manufacture playing card stock an idea inspired by the thought that the gamblers in the California gold rush would create a heavy demand for cards.

WINTHROP L. CARTER

Start Gummed Department

To digress slightly, Carter, Rice & Co., started a manufacturing department for making gummed paper and tape in 1902, occupying space in a building in South Boston. A fire cleaned it out on Washington's Birthday, 1904. Instead of giving up this project it was decided to find other quarters. The result was the purchase of the Nashua plant and the organization of the present company, then known as the Nashua Card Gummed and Coated Paper Company.

For the next few years gummed and coated products were its principal lines. In 1907 manufacture of waxed paper was begun in a small way, but developed so rapidly that by 1910 another plant in Nashua was leased for that purpose alone.

Name Changed in 1916

In 1916 the name of the Company was shortened to Nashua Gummed and Coated Paper Company; the making of cards and card stock having been discontinued.

In April 1920 so as to meet the problem presented by Canadian tariff barriers, Nashua established a subsidiary company at Peterborough, Ontario, the Canadian Nashua Paper Company, Ltd. This Canadian Company then was, and still is, devoted to the manufacture of gummed and waxed products.

In 1923 James R. Carter, president of the company and one of its principal founders, died and Winthrop L. Carter was elected to fill the vacancy.

In 1924 a young and growing division of the company, the Package Sealing Division, was incorporated separately under the name of Nashua Package Sealing Company. This subsidiary is devoted to the manufacture of tape moistening machines and package sealers and the sale of these machines, tape and greaseproof inserts.

In 1925 by dint of careful planning, utilization of improved equipment and leasing of outside storage space the Nashua Company was able to give up its lease on its waxing plant and consolidate its manufacturing and operating activities within its own plant on Franklin Street. All this was done, not only without sacrifice of capacity but with a resultant increase in productivity.

Take on Sure-Hold Line

In 1926 Nashua took on the Sure-Hold line of paper products for laundries; under a subsidiary company which was later merged with the parent organization. During this same year the activity of the Canadian plant was increased by the establishment by Nashua and the Sealright Company of Fulton, N. Y., of the Canadian Sealright Company, Ltd., to manufacture milk bottle tops and paper containers for the dairy industry.

In 1935 Nashua purchased the assets of the Package Paper Company of Holyoke, Mass. This act launched Nashua into the producing of printed "Cellophane" which is now an increasingly important part of its business.

Area of Buildings Increases Four Fold

In the thirty-six years of operation of Nashua Gummed and Coated Paper Company the area of its buildings has increased almost fourfold. There are 25 times the number of employees that there were at first, and the volume of business done in a year is almost 30 times that of its early period.

Throughout Nashua has not only always endeavored to maintain high quality but it has been ever trying to devise new uses for paper which will prove profitable for its customers.

NASHUA GUMMED & COATED PAPER CO.

Nekoosa-Edwards Paper Co.
Port Edwards, Wis.

The Nekoosa-Edwards Paper Company had its inception in 1869, four years after the close of the Civil War when John Edwards, Jr., and his partners established the first pulp mill on the Wisconsin river.

From this nucleus there has been developed throughout the intervening seventy-one years the present Nekoosa-Edwards industrial organization with mills at Port Edwards and Nekoosa, Wisconsin, an artificial lake with a shoreline of more than fourteen miles and more than thirty thousand acres of forest lands. These early paper pioneers saw in the Wisconsin river area, with its vast timber and water resources, an ideal location for the establishment of paper manufacture. Originally organized as the John Edwards Manufacturing Company, the Nekoosa - Edwards Paper Company was incorporated in 1908 to include the Nekoosa mill, the Port Edwards mill, the Centralia mill, and the Nash Lumber Company holdings. The Centralia mill, which burned in 1912, was replaced the same year with a hydro-electric plant and the electrification of the mills began.

NEKOOSA-EDWARDS PAPER CO., PORT EDWARDS MILL

Under the leadership of L. M. Alexander, who was made president and general manager of the company in 1911, the expansion and modernization of the properties was vigorously pursued. Modern hydro-electric plants were constructed at both mills.

Practical, far reaching foresight is exemplified in a forestry program launched by the management in 1925 to perpetuate readily available supply of wood. Complete in every detail down to scientific selection of the very seed from which future pulp wool will grow, this Nekoosa-Edwards forestry program has now reached a point where more trees are planted annually than are being consumed. Thirty thousand acres of land are now under forest cultivation, all within easy trucking distance of the mill. Each year from three and a half to four million trees, grown from seed in the Nekoosa-Edwards nursery, are planted to guarantee a permanent wood supply.

Nepco Lake, an artificial lake begun in 1925 and completed the following year, now supplies the mills with 35 million gallons of pure water daily. Man-made and spring fed, this lake guarantees the water supply necessary in the manufacture of high grade fine and specialty papers.

In 1927 L. M. Alexander turned over the active management of the company to his son, John E. Alexander, who succeeded his father to the presidency of the organization in 1934. Carrying on the program of constant research and progress instituted by L. M. Alexander, the company introduced the watermarked line of Nekoosa Pre-Tested Business Papers in 1935. Backed by coast-to-coast promotional work and an extensive advertising and merchandising program. Fine paper shipments have grown constantly year after year.

Paralleling the progress of the fine paper manufactured in the Port Edwards mill is the wrapping specialty and treated food papers line manufactured in the Nekoosa mill. In addition to the many standard established brands such as King William butchers, Nepco Delicatessen and Modelrap, new sheets such as Nepco Refrigerated Locker Paper and others are being introduced and meeting with wide acceptance throughout the trade.

A Special Research Division

A special research division has also been set up for the purpose of developing specialty and specification papers for industrialists who require special papers to do special jobs.

The personnel program of the company has been as progressive as the technical program. Almost 90 per cent of the employees receive health and accident benefits through the Nepco Employees Mutual Benefit Association, and carry life insurance therein. Active credit unions in both mills afford the employees opportunity of borrowing at reasonable rates and savings programs at better than average interest.

Safety Is Keyword

Safety is the keyword of every Nekoosa-Edwards operation and the low accident rate is attested by the fact that many placques for leading standings in National Safety contests adorn the personnel office walls.

Ohio Boxboard Co., Rittman, Ohio

The Ohio Boxboard Company was established in 1903 by the late Edwin J. Young of Wadsworth, Ohio. It was started by necessity. In that early day, the carton industry was in its infancy, and the Ohio Match Company, which Mr. Young and his associates founded in 1895, had difficulty in obtaining the boxboard it needed for the packing of matches. The one board machine, with 30 tons daily capacity, more than filled the need, and additional outlet was sought. Excess tonnage was sold to the K-D Box and Label Company, Cleveland, which was later purchased by the company in 1905. A new plant was then built in Cleveland for the manufacture of both folding cartons and set-up boxes.

Edwin J. Young

With this modest beginning, it was necessary in 1908 to add a second board machine to take care of increased demand. Meanwhile, the rubber industry was growing in nearby Akron, and The Ohio Salt Company's plant had been built in Rittman. Conveniently located, The Ohio Boxboard Company developed and supplied the packaging for these new industries.

In the years immediately following, the company pioneered the development of the solid fiber shipping container, and, with the cooperation of other manufacturers, obtained its acceptance by the railroads for freight shipment. During this same period, the company's engineers also worked out a process for obtaining moisture-resistance in paperboard by lamination with asphalt. Further development of this process resulted in a product which is today marketed under the company's registered trade name Aqua-Seal.

The corrugated shipping container field was entered in 1923, and a third paperboard machine was installed primarily to supply liner board for this division. At the same time, the paper book match was gaining rapidly in popularity. The match stick presented an unusual requirement in paperboard manufacture, and the only satisfactory material was then imported from Germany. Intense application to this problem resulted in the development of a match stick board which is now a major item in the Company's production.

In the decade from 1920 to 1930, the demand for folding cartons and shipping containers more than doubled. Paper packaging became recognized as an art as well as an industry. The industry now ranks twelfth in the United States, and this company would like to believe that it has made sound contribution to that development. It is interested in the further advancement of paper packaging, and maintains a staff of trained designers and engineers for use by its customers.

Today, with four paper machines, daily capacity is 500 tons of boxboard, most of which is being fabricated.

Officers are Wayne Young, president; F. S. Wakeman, vice president and sales manager; C. E. Carpenter, vice president in charge of production; C. M. Forman, secretary and treasurer.

Ohio Boxboard Co., Rittman, Ohio

The Racquette River Paper Co.

The Racquette River Paper Company was established in 1890 by James A. Outterson. In the Black River district, about Watertown, Dexter, and Carthage, he was often the moving spirit. Mr. Outterson was quite a character, a man of great energy, with ability to rush construction and get a mill going. He was better at that than he was at general mill management.

About 1890 he turned his attention to the Racquette River. Some fifty years ago, acquiring an option on a dismantled sawmill at Unionville, just north of Potsdam village, he finally persuaded a group of local men to organize the Racquette River Paper Company and build a mill. In this group, and its first president, was George W. Sisson. The group also included James A. Outterson; F. F. Flint, secretary; F. L. Dewey, treasurer; and Flora E. Snell, mother of former Congressman B. H. Snell.

RACQUETTE RIVER PAPER CO.

After rapid construction, a wooden mill with one machine, pulpwood grinders, and a small sulphite plant began operation. The initial product was newsprint, followed by sulphite manila for which, in those days and for several years, there was a ready market. Mr. Sisson, an old-time lumberman and timberland owner, was largely instrumental in securing lands and timber for the company, which holdings, in succeeding years, gradually reached a total of nearly one hundred thousand acres.

The original paper machine was a 110" Bagley & Sewall machine, to which was added, within a few years, a 76" machine, these two being operated by the same parties until 1901. At this time the daily production was about twenty tons of finished paper, from ground wood and sulphite made at the plant.

In August, 1901, the entire capital stock was taken over by George W. Sisson. His sons then came into the company, with Rufus L. Sisson as Treasurer and George W. Sisson, Jr., Secretary. F. T. E. Sisson began as a papermaker and eventually became Mill Manager. The timberland department was under Charles H. Sisson, and the general management outside the mill with Fred R. Sisson. Since that time, the entire ownership and management has remained in the Sisson family.

It soon became apparent that the plant must be entirely rebuilt, its capacity increased, and modern concrete and brick buildings, including a steam power plant, hydroelectric development, an electric groundwood plant, a completely rebuilt sulphite plant of fifty tons capacity, and a new 136" paper machine, thus bringing the capacity to seventy-five tons of finished paper per day. While these improvements cover the period between 1908 and 1913, they by no means represent all of the changes and additions which have been the company's continuing practice, up to the present time. For the beating and preparation of stock for higher-grade papers, additional equipment of the most modern type, including the latest type breaker beaters, refining engines, and hydrafiners with greatly-increased operating power, has been installed. Complete control formulae for the treatment of stock for special papers are governed by automatic measurement and control devices. On each of the paper machines, additions and improvements have increased speed and improved product. Here again, automatic control methods add uniformity and quality.

The Company has been fortunate in having the best Adirondack spruce from which to make pulp of excellent quality for special papers, producing both bleached and unbleached sulphite pulp and special ground wood pulp for certain papers. The Company has also been particularly fortunate in its power development, owning the entire 63-foot fall in the Racquette River for a distance of three miles above its mill. Two hydro-electric plants with the full flow of the Racquette River supply much of the needed power.

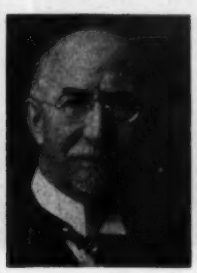
The last word in a steam plant is to be found in the recent installation of two B & W Boilers, equipped with preheaters, adapted to pulverized coal, and all under automatic control of fuel and air feed. This mill was one of the early paper mills to make use of pulverized coal, the installation of which, under Plant Engineer, A. C. Smith, made possible the production of steam at a cost well below that of most mills in the industry.

These changes have paralleled the coming into the business of the third generation in the persons of Rufus L. Sisson, Jr., Sales Manager; Lewis H. Sisson, Western Sales Manager; Walter C. Sisson, Treasurer; George W. Sisson 3d, Sales Promotion; and F. T. E. Sisson, Jr., Personnel. Stanley H. Sisson, as manager of timberlands, follows Charles H. Sisson in that department.

The product of the mill is widely distributed. In the New York Sales Office are Frederick McNicoll and Donald F. McCall, both well and favorably known in the trade and most efficient.

While preceded by other good men, the present Superintendent of Production, Mr. John G. Murray, has, during the past twelve years, demonstrated not only his papermaking skill, but his ability to make friends.

GEO. W. SISSON



RUFUS L. SISSON

FRED R. SISSON

CHAS. H. SISSON

GEO. W. SISSON, JR.

F. T. E. SISSON

Rising Paper Co., Housatonic, Mass.

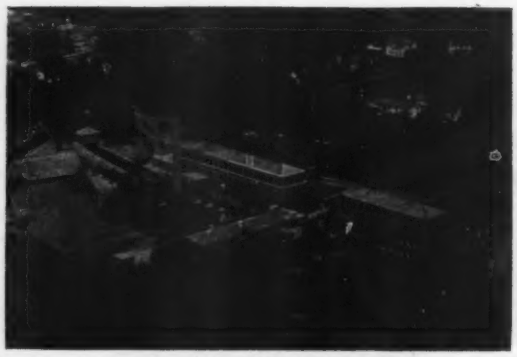
The Rising Paper Company started operations as the B. D. Rising Paper Company the middle of the year 1900. Bradley D. Rising was president, Charles McKernon was treasurer, Walter J. Raybold was secretary and salesman, and Robert O. Harper was superintendent. Horace A. Moses, nephew of Mr. Rising and present president of the Rising Paper Company, was a director. Mr. Rising had been manager of the Agawam Paper Company from 1872 until its absorption by the American Writing Paper Company in 1899.

With Mr. Moses, Mr. Rising had inspected the Owen Paper Company on the outskirts of the town of Housatonic. This plant had been owned by Owen and Hurlburt since 1858 when the two purchased a wooden building in which papermaking equipment had been installed in 1822. Four years after purchasing the site they formed the Owen Paper Company and for twenty years produced a line of high grade papers; in fact, its paper won a first prize at the Centennial Exposition in Philadelphia in 1876. In the last years of its operation the company had been under the ownership of Henry D. Cone, who envisaged building the finest and most up-to-date paper mill in the country. Unfortunately this modernization was never completed because of financial difficulties.

Mr. Rising took over this defunct mill and organized the B. D. Rising Paper Company, completing the construction of the Cone mill. Upon Mr. Rising's death in 1903, Edmond Day became president but was soon forced to retire because of ill health. O. A. Miller of the Central Ohio Paper Company was then elected president, holding this position until his resignation in 1918. From that time until late 1928, Mr. Charles McKernon was president.

Late in the fall of 1928, Mr. Moses, president of the Strathmore Paper Company, bought the controlling interest in the company and reorganized it as the Rising Paper Company. Mr. Raybold, who had been with the company since its inception, became president and Mr. Moses became treasurer.

Mr. Raybold continued as president of the company until his death in 1938. Mr. Moses then assumed the presidency of the company and still holds this office. Other executives of the company are Fred E. May, vice president in charge of sales; Richard H. Dempsey, vice president in charge of manufacturing; George E. Williamson, treasurer; Miss Madeline Moses, assistant treasurer; Walter E. Daverin, comptroller and secretary.



Rising Paper Co.

At the present time the mill produces bond and writing papers, ledger papers, index bristols, direct advertising (book and cover) papers, wedding papers and bristols, technical papers and specialties. As a matter of fact, Mr. Rising was reputed to be the first manufacturer of index bristols, and under his management the company early assumed a leadership in this field which has been continued to the present.

One of the first objectives of the new management, when they assumed control of the company in 1928, was to make the mill thoroughly up-to-date. Since that time, the equipment has been completely checked and revised in order that it might have the most modern and efficient features.

Rising has two 94-inch Fourdrinier machines, and has a daily capacity of 50,000 pounds of paper.

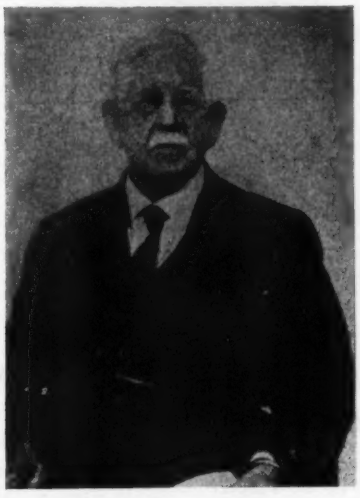
Water for making Rising papers comes from two artesian wells which are 600 feet deep.

H. A. Moses | B. D. Rising | W. J. Raybold | F. E. May | R. H. Dempsey | G. E. Williamson

Shryock Brothers, Incorporated
Philadelphia, Pa.

The Shryock Brothers business had its inception in 1790 when John Shryock founded the Hollywell Mill in Chambersburg, Pennsylvania, to make printing and wrapping papers and later to make banknote paper once extensively bought and used by the United States Government.

In the late eighteen twenties William Magaw interested George A. Shryock in the principle of adapting his patented strawpulp process to the practical manufacture of paper and in 1829 the Hollywell Mill commenced experimenting with the method and it is said of George Shryock that he made paper of every description from wheat, rye, barley, oats and buckwheat straws; from corn blades; a wide variety of grasses; corn husks; white pine shavings; willow wood; refuse tan. He bleached straw to produce a printing paper but with rags at from two and one-half to four and one-half cents a pound it did not pay to bleach straw.



S. S. Shryock, Sr.

Early Straw Production

Early records of the Hollywell Mill show that once George Shryock had it in satisfactory operation he boiled up as much as one thousand tons of straw at a time and produced up to thirty reams of paper a day. When the trial period was successfully passed Shryock completely eliminated all manufacture from rag in the Chambersburg mill in favor of the use of strawpulp. A small cylinder machine was installed which George Shryock claimed to be the first of its kind to operate on that material. Later he invented the grooved wood roll for the production of binders boards and box boards. The expanding output led to the construction of a new mill dam, a new drying house and additions to the original building. Four pulp engines were installed and a new steam house with tubs added.

Magaw Rights Acquired

George Shryock and Nicholas G. Ridgley acquired the exclusive rights to the Magaw patent for the eastern part of the country and when Nicholas Ridgley died in 1831 the firm of G. A. Shryock & Co. was organized by George Shryock, S. D. Culbertson, Reade Washington and Alexander Calhoun. The new company built the "Mammoth" mill on the Conococheague creek near Chambersburg with one hundred and two miles of drying poles, seventeen large dry presses, eight pulp engines and eight machines with which an output of one hundred pounds an hour was achieved.

Chambersburg Mill Burned

The Chambersburg mill was burned in 1864 during the Civil War sacking of Chambersburg but at the close of the conflict George Shryock and his brother John started the Papyrus Mills at Shippensburg, Pennsylvania, to manufacture wrappings and boards. George Shryock ran the mill, and John opened an office in Philadelphia to market the output.

Shippensburg Mill Lost

Lightning destroyed the Shippensburg mill in 1898 and shortly thereafter Samuel S. Shryock purchased the Dorlan Mills in Downingtown and began the manufacture of binders boards.

The business was incorporated in 1909 by Samuel S. Shryock, Sr., Samuel S. Shryock, Jr., Owen A. Shryock and Clarence C. Dorsey. Samuel Shryock, Sr. died in 1926 at the age of eighty-six.

Present Officers

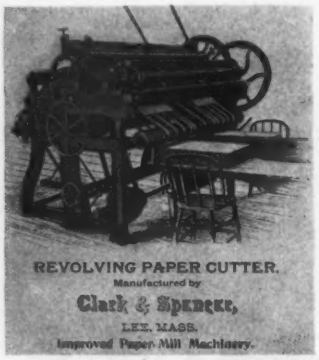
Present officers of Shryock Brothers, Incorporated, are: Owen A. Shryock, President; S. S. Shryock, Jr., Secretary and Treasurer; C. C. Dorsey, Vice President. The year 1940 is the one hundred and fiftieth anniversary of the company, marking a century and a half of successful operation by members of the Shryock family.

Clark-Aiken Co., Lee, Mass.

The forerunner of the present Clark-Aiken Company was established in 1827 in Lee, Massachusetts, when E. P. Tanner began repairing paper mill machinery in the machine shop of a shoddy mill operated by Beach & Royce. In 1828 Tanner bought the machine shop and devoted its full resources to paper mill repair work.

The simple machinery of the mills which had sprung up in the vicinity of Lee since 1816, when hand made paper making had its inception in South Lee, required little more than blacksmithing equipment for their essential repairing and Tanner had this and more. Then, too, he was both a good mechanic and astute business man who intuitively sensed need for new fittings and auxiliary devices. Early records of the business he built show that in a very short while he was supplying vital equipment to mills throughout Massachusetts, Connecticut and adjacent New York State.

The popular outfit of that period was a single cylinder mould, two small presses and five dryers. Many mills used straw as their pulp material and this development in conjunction with the expanding manufacture of rag papers in the vicinity of Tanner's shop contributed signally to its prosperity.



CUTTING MACHINE DESIGNED BY H. M. SPENCER IN WHICH WERE INCORPORATED ORIGINAL PRINCIPLES STILL IN COMMON USE.

Operated as E. P. Tanner & Son

Before Tanner's death in 1886 he had brought his son into the business and operated as E. P. Tanner and Son. After the death of the founder there was a period when the shop was known as Tanner and Perkins but it was the next phase that marked the real development. H. M. Spencer, who learned his trade in an axle foundry doing a national business, saw opportunities for extending the paper machinery line and bought out the Tanner and Perkins interests.

It was the mechanical skill and foresight of Spencer to which a number of principles in common use today may be directly traced. Perhaps his outstanding creation was the revolving paper cutter which is the great-great-grandparent of the current Clark-Aiken fast cutter.

Later Developments

The later developments of the business are familiar to many throughout the paper industry. H. C. Clark and E. D. Jones had formed the business in Pittsfield which has grown into the E. D. Jones and Son Company. Clark withdrew to buy a half interest in Spencer's machine shop in Lee and changed the name to Clark and Spencer. Later, Spencer sold his half interest to Clark who brought his son in with him and the business became known as H. C. Clark and Son and continued as such until the plant was burned to the ground in 1919.

Business Reorganized

The business was completely reorganized under the title of the Clark-Aiken Company and, provided with the present modern factory and under the guidance of Walter S. Aiken, it has carried the development of the early machines up to the present production of fine precision devices which contribute signally to successful paper manufacture.

WOODEN BUILDINGS, COMPRISING MACHINE SHOP AND FOUNDRY, AS OCCUPIED BY CLARK & SPENCER PRIOR TO ITS DEMOLITION BY FIRE IN 1919. THE MODERN BRICK BUILDINGS SHOWN AT RIGHT WERE CONSTRUCTED BY REORGANIZED CLARK-AIKEN CO.

Thilmany Pulp & Paper Co., Kaukauna, Wis.

In 1883, Oscar Thilmany, an American citizen, but a native of Germany, established the Thilmany Pulp and Paper Mills in Kaukauna, Wis., on the Fox River, about twenty miles up stream from Green Bay. These mills were destined to be responsible for the inauguration of many of the important earlier paper-making developments in this country, and continue to be leaders in the specialty field. Initially butter plates were manufactured from ground wood pulp. In 1889 the first paper machine was installed and in October of that year the first paper was being successfully produced. In December, 1891, No. 2 machine was erected to give the mill two Fourdriniers, 82 and 90" respectively, and four beaters. No. 3 machine was built in 1895, No. 4 in 1896, and No. 5 in 1897. These last three machines were so-called "Flying Dutchmen" or "Yankee" Fourdriniers. This type of machine originated in Germany, and Mr. Thilmany worked from modified German plans.

The "Yankee" machine was designed to make paper duplex in character, possessing a high finish on one side, and a comparatively rough surface on the other side. The "pick-up" feature made possible a wide range of basis weights from 10 to 60 lbs. to the ream, 24 x 36. The two-finish effect was produced by the use of a large steam heated drier, or cylinder, in place of the battery of smaller driers common to the ordinary Fourdrinier machine. The operation of that first machine proved so successful that two units were added within a few years.

Increasing responsibilities obliged Mr. Thilmany to add to his small organization. In 1897 he employed C. W. Stribley, who had had earlier experience with the Kimberly-Clark Company, as his manager, and the work of expansion continued on an increasing scale. In 1901 Mr. Thilmany, desiring to retire from active business and return to his native country, sold his mill to the present owners, Thilmany Pulp and Paper Company. Mr. Thilmany was elected its first president, but soon turned over his interests to the new owners. M. A. Wertheimer became the president, and Mr. Stribley, treasurer and a director. The association of these two men centinued until Mr. Wertheimer's death in March, 1939.

Mr. Wertheimer had for years been a paper jobber and converter in San Diego, Calif. Among other things he had built up a large business on the Pacific Coast in plain and printed tissue wrappings for citrus fruits and vegetables. With one of his shop men he had designed and built a new type of printing press for that purpose. The Thilmany mills were his chief source of supply for these papers, and his contact with the mill stimulated the development of paper specialties.

Mr. Wertheimer was a man of outstanding business ability, and possessed of a vivid imagination—a rare combination. Under his guidance, and with the help of Mr. Stribley, who had managed the mills almost completely in the later years of Mr. Thilmany's ownership, the business grew and prospered. These men were responsible for many innovations in the field of special papers. Mr. Wertheimer is credited with pioneering the light weight, strong machine glazed wrapping papers in this country, as substitutes for the heavier and coarser grades. In collaboration with their superintendent, O. M. Farwell, Wertheimer and Stribley conceived the idea of impressing designs on paper at the drier, in the course of manufacture, and with the use of a special marking roll. A patent on this device was granted, and later extended because of improvements, and Thilmany became the first mill to make wrapping papers with surface designs introduced in the dryer chain.

About 1905 Mr. J. E. Thomas left the employ of the Nekoosa Paper Company to join the Thilmany organization. He became vice-president, and contributed greatly to the ever growing business. He died in 1918 at the age of forty-seven, and with his passing the company suffered a severe loss.

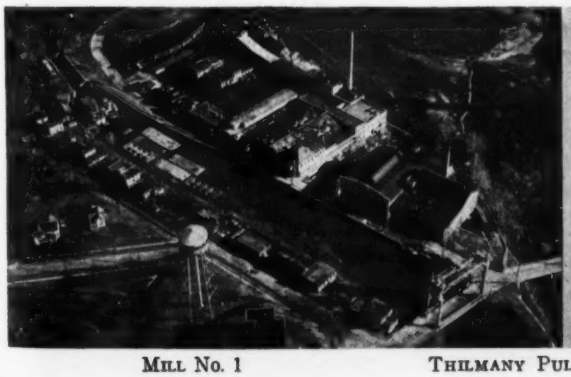
In 1911 one of the first sulphate pulp mills in the country was constructed, located adjacent to the paper mills. Designed to make 30 tons of kraft pulp per day, it was enlarged from time to time. Today it has a capacity in excess of 100 tons. One of the first plants to bleach kraft pulp was installed. All of this paved the way for experimentation, and development of papers of unusual strength, pliability, resistance to moisture, and so on. There are included in this group so-called amber glassine and greaseproof, supercalendered papers, etc. Amber waxed carton lining paper, made from pure bleached sulphate pulp originated in the Thilmany mills. It immediately revolutionized packing of crackers and protection of food products where paper resistant to moisture and grease was required. A pioneer in the manufacture of asphalt laminated papers, Thilmany originated Waterproof Liners for container manufacturers, and developed many uses for these particular grades.

In 1916 the company purchased the plant of the Wisconsin Tissue Paper Company at Appleton, Wis., but in 1930 all manufacture was consolidated at Kaukauna. With the acquisition of the Appleton mill, the number of paper machines was added, making the total eight machines—three Fourdriniers, and five "Yankees".

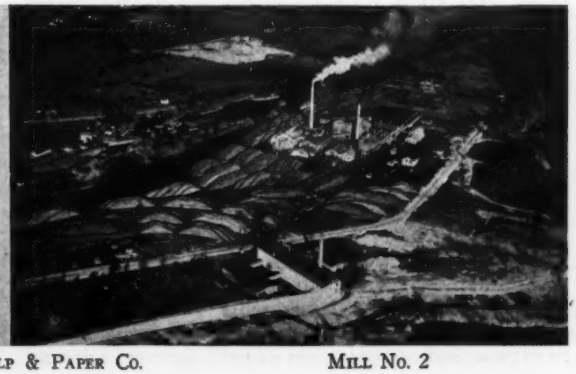
Mr. Wertheimer was active in the development of the business for nearly forty years, or until his death in 1939.

Today Thilmany is a major producer of a large number of grades of paper.

The present officers of the company are: President, Karl E. Stansbury; Vice-President in Charge of Sales, E. H. Jennings; Vice-President in Charge of Manufacture, C. R. Seaborne; Vice-President, Marvin Preston; Secretary, E. H. Jennings; Treasurer, C. R. Seaborne. These officers, together with C. W. Stribley, R. S. Wertheimer, and George J. Stansbury constitute the board of directors.



MILL NO. 1



MILL NO. 2

THILMANY PULP & PAPER CO.

The Tileston & Hollingsworth Co.

The founding of the Tileston & Hollingsworth Company extends back to Colonial days. Provided with an exclusive franchise, Daniel Henchman, Gillman Phillips, Benjamin Fanuil, Thomas Hancock and Henry Dering rented an old mill which had been built in 1706 at the bridge over the Neponset river in Milton, Mass. Dering was superintendent and Henry Woodman was engaged as foreman. The other members of the company appear only as investors in the enterprise. Not until 1730 was paper regularly manufactured. Jeremiah Smith was engaged to take charge in 1737, and in 1742 he purchased the mill and seven acres of land. An English paper maker, John Hazleton, was hired as foreman.

In 1760, James Boies, son-in-law of Jeremiah Smith, became acquainted with Richard Clark, a practical paper maker, and persuaded him to go to work for Mr. Smith. Five years later, Boies erected a paper mill in Milton. He took for his partner Richard Clark and business was done under the firm of Boies & Clark. Within a short time Boies built a second paper mill opposite his first mill, in which Clark had no interest. In 1771, Boies sold a half interest in this mill to his son-in-law, High McLean and the firm became Boies & McLean. The original paper mill which Clark left to become associated with Boies, was continued by Jeremiah Smith until 1769 when he sold a half interest to another son-in-law, Daniel Vose. When Smith retired, Vose became sole owner and conducted the mill successfully for over twenty years.

Boies & Clark had been an offshoot from the original mill and it is through the succession of their interests that we come to the founder of the Tileston & Hollingsworth Company. In 1777, Boies and McLean consolidated the two mills. Michael McCarney was admitted in 1782. Fire destroyed the mill in that year and it was rebuilt and also a new chocolate factory on the Dorchester side of the river, which was later converted into a paper mill. In 1793, Jeremiah Smith Boies built a new mill further up the river to combine the manufacture of chocolate, flour and paper. He hired Mark Hollingsworth to take charge of the paper making.

Mark Hollingsworth was then about sixteen years old. In 1801, Hollingsworth formed a partnership with Edmund Tileston and Boies rented the mill to them. Fire destroyed the mill in 1805. In 1809, the young men leased two other mills, one of them had been rented to George Bird, founder of Bird & Son, of East Walpole, Miss. The other mill was known as the Gillespie Mill. In 1817, the old Boies chocolate mill was converted into a paper mill by Tileston & Hollingsworth. In 1774 they acquired another paper mill at the Lower Falls and in 1823 the firm leased the Charles Baker & Company's mill.

The Tileston & Hollingsworth Company continued to expand and in 1831 a son of each partner, Edmund P. Tileston and Amor Hollingsworth, were admitted to the firm. Edmund Tileston, senior, died in 1839 and Mark Hollingsworth retired the following year. In 1836, the William Summer Paper Mill was purchased. The business continued to be conducted in a highly successful manner for many years. In 1860, Frank L. Tileston, son of Edmund P. Tileston, and Amor L. Hollingsworth, was admitted to the firm. The young men were ambitious and directed John L. Seaverns of Worcester, Mass. to produce the best machinery possible and the resulting Eagle Mill was known for the high quality of its products. The equipment included a 76-inch Fourdrinier and beaters of two to three hundred pounds' capacity.

Amor Hollingsworth died in 1872 and his son, Amor L. Hollingsworth, inherited his father's estate, which is now the property of the latter's nephew, Amor Hollingsworth, the present head of the Tileston & Hollingsworth Company. Frank L. Tileston died in 1885, leaving his interest to his brother, John Boies Tileston. From this period there follows a long period of successful operations. In 1879, important improvements were added and steam power was installed. In 1881, manufacture of paper was discontinued at the old Fuller Mill and the 72-inch Fourdrinier was moved to the Eagle Mill, where one of the first Jordan engines was set up in 1887. This was the invention of Joseph Jordan, according to Robert Mossman, for many years superintendent with the Tileston & Hollingsworth Company. Jordan had worked for the Ivanhoe Paper Company, of Passaic Falls, N. J., and the idea occurred to him while looking at some discarded speed cones in the mill yard. Super calenders were also installed in the same year. Increased business led to additions to the Hyde Park Mill. At the death of Mr. Tileston in 1898, George F. Child succeeded him. In 1905, the responsibilities of management passed to the fourth generation of the Hollingsworth family.

The present officers of the Tileston & Hollingsworth Company are: President, Amor Hollingsworth; vice-president and assistant treasurer, Arthur V. Howland; treasurer, E. H. Clapp.

The Gillespie Mill of the company made a special blue sugar loaf paper, in the manufacture of which ground logwood was used for coloring. In this respect, the company is probably the first or among the earliest users of groundwood. The Summer Mill, achieved an enviable repuation for lithograph, etching, chart and plate paper. The Eagle Mill was largely devoted to the production of fine book papers and made for many years a special blue wrapping paper for the Walter Baker Chocolate Company. Quality, rather than quantity, is the company's ideal today as it has been in the past. The Tileston & Hollingsworth Company is now in its 120th year as a corporate entity.

Waldorf Paper Products Co., St. Paul, Minn.

The Waldorf Paper Products Company was established in 1886, at St. Paul, Minn., in that year 1886 a partnership, known as the Baker-Collins Company, was formed, occupying a small loft at 125 East Third street. Its principal business was job printing. This was the beginning of the present Waldorf Paper Products Company. The partnership expanded, and in 1891 it was incorporated as the H. L. Collins Company. Its first officers were H. L. Collins, president, M. R. Conable, treasurer, and M. W. Waldorf, secretary.

As the company grew it added new departments, among them an office stationery store, a druggist label department, a book bindery, and a badge and banner department. The addition of these departments required additional space, and by 1900 the company was occupying a five-story building which was built for them according to their needs by D. R. Noyes. The new factory was located at 61-67 East Tenth street and was ready for occupancy in January, 1901. At this time the label and folding box departments were added. These were the departments that gave the company the foundation on which the present business was built.

Under the able management of M. W. Waldorf, the folding box and label departments grew to such extent that the other lines were dropped, and the entire energy of the organization was devoted to the printing of labels and manufacturing of folding boxes. The next four years showed phenomenal growth, and by 1905 it was decided that more space was needed. Looking into the future a site was picked in the new industrial district located in the Midway between the cities of St. Paul and Minneapolis. Here was built the modern factory type building covering an area of 70,000 square feet all on one floor and equipped with the most modern machinery for printing labels and manufacturing folding boxes. This new building was occupied in the spring of 1907 and was the first unit of the present Waldorf Paper Products Company plant.

The demand for the folding cartons and paper shipping containers was growing rapidly, so in 1907 Mr. Waldorf and his associates formed the Waldorf Boxboard Company for the purpose of erecting a boxboard mill to furnish board for the rapidly growing box plant. The company was incorporated with M. W. Waldorf as president, C. P. Noyes as vice-president, H. L. Collins, secretary, and Douglas Putnam, treasurer. Land was purchased adjoining the H. L. Collins Plant on which were erected buildings large enough to house a two-machine mill. The first machine installed was a 110″ trim cylinder machine with all the necessary auxiliary equipment. This property was completed October, 1908, and had a capacity of 40 tons of boxboard daily.

In 1909, the company started in a small way to make corrugated and solid fibre shipping containers, buying the sheets from the Chicago Mill and Lumber Company. However, by 1911 the department had grown to such an extent that a 110″ paster for fabricating solid fibre board and wallboard was installed, and in 1913 the first corrugating machine for making corrugated boxes was added. Also, during this year, because of the growth of these two new departments, the second board machine was added.

Located in a territory in which the public had not been educated to saving waste paper, the company experienced difficulty in obtaining raw material in an adequate quantity; therefore in 1912 the men interested in this business bought the American Scrap Iron and Metal Company of Minneapolis and the West Side Paper Stock Company of St. Paul and formed a new corporation known as the American Paper Stock Company which took over the business of the acquired companies. To handle efficiently the collection of waste paper, a new building was built adjoining the boxboard mill, and here was set up the waste paper sorting operation which has served the company well. By 1917, it seemed wise to consolidate the paper stock, the mill, and the box departments under one management for the greater efficiency of the operation. At this time the Waldorf Paper Products Company was formed with M. W. Waldorf as its president, Paul N. Myers, vice-president, (who had purchased the interests of H. L. Collins and others in the year 1915) and Douglas Putnam, secretary and treasurer.

Again in 1929, the company suffered the loss of its president. Paul N. Myers, who had been very aggressive and added much in building the company, died very suddenly, and in his place Homer P. Clark, one of the directors of the company since its organization, became its president. All the other officers remained the same with the exception of Paul A. Schilling, who was elected secretary and general manager. In 1931, Douglas Putnam, who had been treasurer of the company since its incorporation, retired, and Paul A. Schilling was elected secretary-treasurer.

During the period of 1930-34 the company did much to improve its manufacturing facilities in all departments. At this time the management increased its production so that by 1934 it had a capacity of 350 tons per day. In 1934, the 126″ paper machine of the Minnesota & Ontario Paper Company was purchased and installed in the strawboard division. In 1933, Homer P. Clark was elected chairman of the board, Paul A. Schilling, president and treasurer, H. C. McDaniel vice-president and secretary, C. G. Maher, F. G. Reicher, and A. J. Waldorf, vice-presidents.

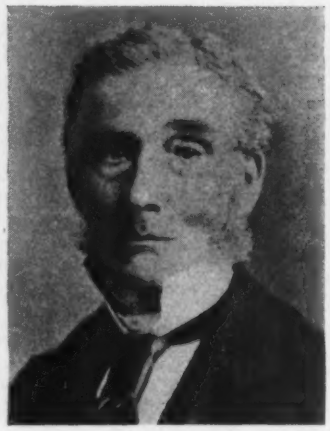
The present officers of the company are Paul A. Schilling, president and treasurer, H. C. McDaniel, vice-president and secretary, C. G. Maher and A. R. Penfield, vice-presidents.

During the years 1936-37 the further expansion of the company's products was the entering of the paper oil can and paper coat hanger fields.

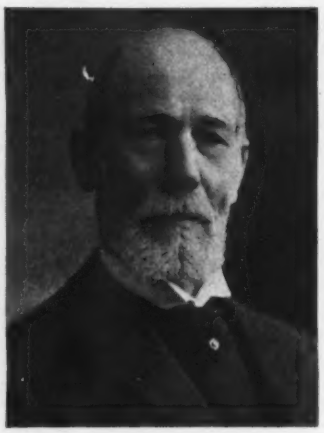
West Virginia Pulp & Paper Co., New York

The cornerstone of the West Virginia Pulp and Paper Company may be said to be a certificate awarded to John Luke of Aberdeen, Scotland, granting him a master's degree from the Association of English and Scotch Paper Makers, on February 22, 1826. In 1852, William Luke, son of John Luke, came to America and became associated with the paper industry. He and two of his sons, John and David, later formed what is known today as the West Virginia Pulp and Paper Company.

The initial step in building the large industrial enterprise of the present time was taken in 1888, when a charter was given for the erection of a mill at West Piedmont, now Luke, Md., across the Potomac River from Piedmont, W. Va. The first organization was known as the Piedmont Pulp and Paper Company. The officers of the company were: William Luke, president; John G. Luke, vice-president and general manager, and David L. Luke, secretary and treasurer. A mill was built at West Piedmont for two paper machines. Production at the start was confined to the manufacture of manila wrapping paper on one 92-inch Fourdrinier machine.



JOHN LUKE



WILLIAM LUKE

In 1892, a third company, known as the West Virginia Pulp Company, was founded and a sulphite plant was built at Davis, W. Va. The three corporations were consolidated in 1897 under the name of the West Virginia Pulp and Paper Company, with the same officers as the original company.

The notable growth of the company has continued from its beginning. In 1899, the West Virginia Pulp and Paper Company acquired the Morrison & Cass Paper Company of Tyrone, Pa. This is now known as the company's Tyrone Mill, a four-machine plant.

The next step was the construction of the Covington plant, at Covington, Virginia, which was begun in 1899. This plant consists of a sulphite pulp mill, a soda pulp mill, a seven-machine paper mill, and two board mills with three machines for making fiber board and liner board.

In 1904, the Duncan Mill at Mechanicville, N. Y., was added to the West Virginia Pulp and Paper Company. It comprises a sulphite pulp mill, a soda pulp mill and a six-machine paper mill. In 1906 the company acquired the Williamsburg Paper Manufacturing Company at Williamsburg, Pennsylvania, consisting of a soda pulp mill and a two-machine paper mill.

In 1937, the new Charleston, South Carolina, plant was opened. This mill has one Fourdrinier board machine which produces 350 tons a day of Kraft Liner Board.

The rated capacity of the company's six mills is 1400 tons of pulp and 1550 tons of paper and board daily. Thirty machines are in operation. The eleven coating machines at Luke, Md., have a capacity of 80 tons of coated paper a day. Each of the company's mills is a self-contained unit, manufacturing its own pulp and where needed, its own soda and chlorine for bleaching. Each mill maintains its own laboratory and engineering division. Adequate supplies of pulp wood are available at each of the mills and an ample water supply is assured.

The company maintains independent and coordinating control in the research laboratories in each of its paper mills, which coordinate in turn with the research laboratory and engineering division in New York. The company regards this work as highly important to the continued advancement of its products.

The large volume of the company's products is distributed directly to more than 1300 major accounts, through sales offices in New York, Chicago, Philadelphia and San Francisco. Distribution is made to thousands of printers and other users of paper by ninety distributing merchants and sold in many foreign countries under the brand names of the various papers. Advertising is done in leading printing, lithographic and other allied trade magazines, augmented by direct mail campaigns. Its own publication, "Westvaco Inspirations for Printers," now in its sixteenth consecutive year, is distributed throughout the United States and in many foreign countries.

The present officers of the company are: Thomas Luke, president; David L. Luke, vice-president; John R. Miller, vice-president; Sidney M. Phelan, vice-president; Adam K. Luke, vice-president and treasurer; Elmer S. Johnson, assistant treasurer; Charles A. Cass, secretary, and Henry L. Condit, assistant secretary.

The West Virginia Pulp and Paper Company has gradually broadened its line of papers. The relative proportion of the grades of paper it manufactures is approximately as follows: paper for magazines and publications, 18 per cent; trade and religious, 6 per cent; books and school books, 4 per cent; printers papers, 9 per cent; paper for converting, 6 per cent; miscellaneous paper, 7 per cent; and kraft papers and kraft boards, 50 per cent.

In addition to the large sales volume of its main products of paper and paper board, the West Virginia Pulp and Paper Company markets a substantial amount of lumber. Its sales of by-products are also important and include caustic soda, chlorine, chalk, oleic acid, abietic acid, activated carbons, resin, turpentine, cymene, ethyl alcohol and methyl alcohol.

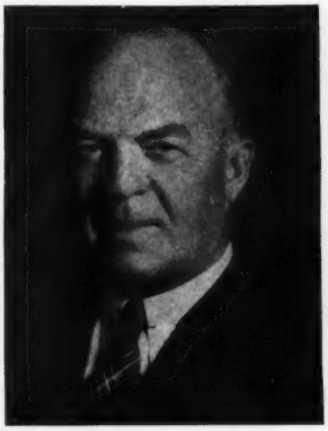
The company manufactures and distributes a varied line of high grade printing and special papers including, enamel, litho, super, super plate, Westvaco super school book and super rotogravure, Westvaco super litho, Inspiration English finish, Westvaco English finish rotogravure and school book, Westvaco opacity and gumming, Inspiration poster and offset, Clear Spring text wove and laid, Westvaco hibulk, Westvaco bond, mimeograph wove and laid, Inspiration, Mada and Covmont tablet, Westvaco white writing, Inspiration envelope and ledger, Westvaco foil lining, Westvaco playing card, post card and tile stock, etc.

Perkins-Goodwin Co., New York

The firm of Perkins-Goodwin Co. was founded in 1846 by Coe S. Buchanan as a paper stock business and operated by him until 1865 when he admitted George F. Perkins and Edward Goodwin as partners, conducting the business under the firm name of Buchanan, Perkins & Goodwin with offices at 43 Dey street, New York.

In 1869 Buchanan retired and the firm continued as Perkins & Goodwin until 1881 when Frank Squire and J. Fred Ackerman were also admitted as partners. The firm name was then changed to Perkins Goodwin & Co. with offices at 84 Duane street. Goodwin died in 1895, Perkins retired in 1904 and Squire in 1905. On January 1, 1906 it was incorporated as Perkins-Goodwin Co. with Ackerman as President.

By that time a sizable paper business had been established. The same year the firm became the sole agents for the famous old English paper house of John Dickonson & Co. A little later they took over a line of Bible and India papers from another old English firm, Lepard & Smiths, Ltd. In 1908 John H. Duffy became president and on his retirement in 1918 was succeeded by Eugene F. Crowe on whose death in 1921, Louis Calder, the present president, took over.



LEWIS CALDER

The firm was now very well established as paper merchants specializing particularly in publication papers such as newsprint, book and magazine. It now began to extend its activities into the wood pulp field acquiring various agencies of Scandinavian, Canadian and Domestic pulp producers.

In 1929 the company absorbed the firm of Scandinavian Pulp Agency, Inc., which had been sales agents in the U. S. A. for a large number of Scandinavian pulp mills; thus, the present firm became also one of the largest distributors of wood pulp in the country.

With the development of the paper industry in the South, the company, in 1937, initiated negotiations which resulted in the construction of the first newsprint mill ever built in the South. The mill began operations in January 1940 as the Southland Paper Mills at Lufkin, Texas, and is now producing newsprint made entirely from Southern wood.

Brownville Board Co., Brownville, N. Y.

The Brownville Board Company, Brownville, New York, located near Watertown on Black River, was incorporated February 25th, 1901, by J. Munson Gamble, C. Willard Gamble, Blanche C. Gamble, for the purpose of manufacturing various types of cylinder machine groundwood and sulphite boards. The boards ultimately manufactured included tags, oyster and ice cream pail, solid manilas, folding boards, etc. The mill structure was poured concrete, one of the first concrete buildings in the locality.

The machine was an 112" four cylinder, with a production of approximately twenty tons per day, and a groundwood mill of the same production, both of which have been increased by additions and improvements until now the production is about double the original tonnage.

J. Munson Gamble and his brother, C. Willard Gamble, operated the plant until, following the death of C. W. Gamble in 1905 Matthew M. Bagg came from the Newton Falls Paper Company to serve as Secretary and Treasurer until 1915 when he resigned.

D. Foster Phillips, also from the Newton Falls Paper Company, joined the staff in 1911 and upon Mr. Bagg's resignation in 1915 became a Director and Secretary.

In 1927 Morse G. Dial became a Director and Vice President, succeeded in 1929 by Willard S. Gamble son of J. Munson Gamble, who became a Director and Vice President on the resignation of Mr. Dial.

W. S. Gamble continued as Vice President until 1936 when, upon the resignations of J. Munson Gamble and Blanche C. Gamble as Directors, he was elected President and Manager; Robert G. Horr succeeding as Vice President.

In 1930 Lawson Ramage joined the Company as Manufacturing Consultant and Assistant to the President, but resigned later.

The superintendents employed during the life of the Company have been: J. A. Fisher, Robert Almstead, Fred Gleesettle, Sr., J. H. McLaughlin, James O'Hara, Fred Frye, D. F. Lawlor, John Brougham, James Quinn, William Sievert, Robert J. Nichols.

The present directors and officers are: Willard S. Gamble, President; Robert G. Horr, Vice President; Ethelwyn G. Dial, Vice President; Dr. Walter S. Atkinson, Treasurer; D. Foster Phillips, Secretary. The staff also includes: Jermain B. Porter, Sales Manager; B. Quinn Hanchette, Accountant; R. J. Nichols, Superintendent; Mrs. Robert Witt (nee Eklund), Personal Sec.; Merrill Dupee, Chief Chemist.

Parsons Paper Company
Holyoke, Mass.

Parsons Paper Company was founded in 1853 by Joseph C. Parsons, who was at that time operating a small paper mill in Suffield, Connecticut. He had been a paper maker for some years before he built the first Holyoke mill. In 1840 he was Agent for the Ames Paper Mill in Northampton, Massachusetts. He left this position in 1843 to take charge of a mill in South Hadley owned by D. and J. Ames. In 1846 this mill was destroyed by fire and Mr. Parsons bought a hand mill at Suffield, Connecticut, which had two vats with a capacity of ten reams of writing paper a day. Soon after he acquired this property, he converted it into a machine mill to make one-half ton per day.

Possibilities for Cheap Power

The building of the Holyoke dam offered possibilities for cheap power that Mr. Parsons was quick to recognize and he associated himself with Aaron Bagg, Whiting Street, Broughton Alvord, Cyrus Frink and Chester W. Chapin to build the Parsons Paper Company on the third level canal in 1853. Various kinds of paper were made in this the first paper mill in Holyoke.

As the business prospered and the organization grew the following well-known papermakers became associated with the company: J. S. McElwain, M. C. Pfahler, Edward P. Bagg, Charles R. Randall, Edwin C. Weiser and William McCorkindale. Upon the death of Mr. Parsons, he was succeeded as Agent by J. S. McElwain. Under his administration one of the largest and best equipped mills for the manufacture of bonds, linens and ledgers was erected on the first level canal, Sargeant Street, Holyoke. The capital stock was increased from $60,000, to $360,000.

New Mill Continued

With the formation of the American Writing Paper Company, the old Parsons Paper Company property on the third level canal was sold to them, together with the real estate owned by the Parsons Paper Company at that time and the new mill on Sargeant Street was continued.

Present Officers

Mr. McElwain was succeeded as Agent by Edward P. Bagg in 1893. Upon his death in 1931, George A. Eastwood became General Manager until his death in 1936. John L. Bagg is the present Vice-President and General Manager; Aaron C. Bagg, President; Elmer B. Cooley, Treasurer; Albert S. Canfield, Secretary.

Millers Falls Paper Company
Millers Falls Mass.

The Millers Falls Paper Company was organized in 1902 by a group of Holyoke papermakers mostly connected with the Parsons Paper Company. E. P. Bagg was elected the first President and C. S. Hemingway, Treasurer and Manager, with A. Finlayson as Superintendent. Incidentally Mr. Finlayson is the only surviving member of that original group.

Cylinder Machine First Installed

At first it was a cylinder machine mill making covers and deckle edge papers but a Fourdrinier machine was soon added enabling the company to enter the bond, ledger and bristol field. Due to the steady increase in business it was necessary to install a second Fourdrinier and enlarge the plant proportionately. This occurred in 1908 and 1909. The cylinder machine together with the cover paper business was sold in 1909 thus enabling the company to concentrate on the other grades of paper.

Mr. Hemingway resigned in 1904 to be succeeded by Angus Cameron as Treasurer and Manager. He continued to thus serve the company until his death in 1920. The present manager, J. L. Bagg, was elected in his place and has held the position ever since, and was also elected President on the death of his father, E. P. Bagg, in 1931.

Production Steadily Increased

The production capacity of the mill has been steadily increased so that today with a new hydro-electric station developing 1300 h.p. and enlarged paper machines running nearly twice their former speed, the yearly output is equal to eight million pounds of rags and sulphite papers.

Wm. E. Hooper & Sons Co., Philadelphia, Pa.

Wm. E. Hooper & Sons Co. was established in 1800 at Philadelphia, Pa. This company is one of relatively few concerns in the United States with a life history of one hundred years or more during which the business has remained under control of the same family. This company operates the big Hooperwood Textile Mills at Woodberry, Baltimore, Md., producing a wide range of cotton goods and specializing in the manufacture of cotton dryer felts for the requirements of the paper industry.

William Hooper Arrives in America

About the time Louis Roter was perfecting the patents on the first Fourdrinier machine in France, and 31 years before the machine was destined to change the entire art of paper-making was introduced in America—the youth, William Hooper, arrived in this country seeking his fortune in the new world. But at that time it was not paper-making, but, rather, the appeal of cotton sails for wooden ships to replace the flax sails made in England that brought about the beginnings of the firm of Wm. E. Hooper & Sons, a firm which later was to pioneer in the manufacture of cotton dryer felts needed for the new, continuous paper-making machines; and to grow with the industry as a supplier of a large proportion of the machine clothing used today.

Plant of Wm. E. Hooper & Sons Co.

The early history of Wm. E. Hooper is as colorful as the age in which he lived. By 1800, Yankee clipper ships sailing into Baltimore had given this port world-wide fame as a shipping center. Equipping these vessels with sail had created a large and specialized industry. Wm. Hooper followed the bustom of that time and apprenticed himself to a sail-maker named Hardester. Before long, the ambitious young man had started in business for himself, taking in his former employer as a partner, and established the firm of Hooper and Hardester, sail-makers, a name subsequently changed to Wm. E. Hooper & Co., and then to Wm. E. Hooper & Sons Company.

Business Prospered from Start

The business prospered from its start and in 1843 the founder retired in favor of his eldest son, Wm. E. Hooper. The boundless determination and enterprise of this young man and his ambition to further the interests of his company are illustrated by the fact that to secure orders for sails he would row down to the mouth of the Patapsco or often farther down the bay to meet in-coming clipper ships, often rising long before daybreak in order to be the first Baltimorean on board.

Found Another Channel of Business

His energies soon sought and found another channel of business in addition to his sail loft; he became one of the city's largest purchasers of cotton which he then secured via Norfolk. Among others he supplied his contemporaries Gambrill and Carroll when they began the production of cotton duck at Woodberry, with their entire requirements and sold their entire output in competition with duck brought from England. Within a few years Wm. Hooper purchased co-partnership rights in the firm of Gambrill and Carroll and later bought out this firm, placing it in his own name. During this time the business was considerably expanded and two new mills were added. In 1873 this energetic industrialist died and was succeeded by his eldest son, James E. Hooper.

The third Hooper had much to do with eliminating the evils of child labor. Baltimore's early cotton duck plants were operated, between 50 and 75 per cent, by boys and girls between 6 and 12 years of age. These children, in addition to women, did about six-sevenths of all the work, which was so simple that the looms could be tended by women and the spinning frames by children. There was nothing unusual, however, in this employment of children in manufacture at this time; it was the universal custom. The hours of labor were from twelve to thirteen and the pay was very low.

Against these accepted conditions, James E. Hooper was in complete opposition. He was one of the first to seek betterment of the condition of his workers. He was one of Maryland's first advocates of a Child Labor Law. In 1873, he ran for Legislature in order to further his ideas in this particular. About this time the various mills agreed to employ no girl under 12 years of age, but it was not until 1880 that there first appeared a law on the Maryland Statute Books declaring "No child under 16 shall be employed in factories more than ten hours per day."

Interest in Workers

Around the early cotton mills, villages invariably sprang up, dependent on the factories for their existence. The mill-owners became the patriarchs of all the families. James E. Hooper interested himself in making the lives of his workers more pleasant and healthful. He even went so far as to built a hotel in Woodberry for female workers in his factory, providing, at only $10 per month, board and comfortably furnished apartments with individual beds and other luxuries that were unusual in those days. However, interest in the welfare and happiness of his and other workers and the time and effort devoted to this work did not prevent Hooper from developing his firm's activities. In 1904, with the assistance of his son William, he built the present Hooperwood Mill No. 1.

Keep Pace With Improvements

James E. Hooper died in 1908 and was succeeded by his second son, William E. In 1917, during the period of the world conflict, William's interests were purchased by his two brothers, Robert P. and James P. Hooperwood Mills No. 2 and 3 were next completed, enabling the concern to augment its business greatly. In the years following the conflict, the company has kept pace with improvements in manufacture that have practically revolutionized the textile industries mechanical processes.

Intrigues Imagination

One machine in particular intrigues the imagination. Into the weaving of its 252-inch wide cotton drier felt goes separate threads supplied by 32,000 spools. An immense complicated and involved piece of mechanism occupying space sufficient for a fair-sized dwelling, guides 32,000 threads moving simultaneously in orderly fashion. Hooperwood Mills normally give work to more than one thousand employees and at the present time are working very close to maximum capacity.

The Aldine Paper Co., N. Y. C.

The Aldine Paper Company was established sixteen years ago, November 1, 1924, with its founder, Harry E. Gould as President and Treasurer from the very inception. His experience in the paper merchant field covers a period since about 1914, when he was hired by the late Max Greenebaum, of Beekman Paper and Card Company as office boy and clerk. The early training under this man, who had tireless, dynamic energy, has been responsible not only for the birth of Aldine Paper Company, but many other paper merchants, including Schlosser Paper Company, William G. Willmann (its present officers), Baldwin Paper Company, Commercial Card & Paper Co., and several other paper companies.

The Aldine Paper Company was originally established at 1270 Broadway, with warehouses on Greenwich Street. In 1927, due to expanding business, the firm removed to 333 Hudson, one of the first paper companies to come to this section which has since become a real paper centre. The warehouse and office were combined, and the space occupied was well over 20,000 square feet.

H. E. Gould, Aldine Paper Company's President, Whose Office Wall Veneer Was Imported from Japan.

Steel shelving and all modern equipment were installed, a far cry from the old days when Beekman Street was the paper merchants' centre, and cases of paper had to be hoisted up by cable, before elevators were installed in buildings.

There were no mill brand papers at that time and printers were at wits' end trying to match samples for printing jobs. Consequently a great deal of the paper business was over the counter. When the long-drawn-out procedure with its waits and lack of system are compared to the well planned mill brand papers, sample books, helpful hints for layout, design, color, and so forth offered today by the paper merchant it is plain to be seen that the paper business has shown vast strides forward.

Mr. Gould vividly recalls the World War period with its scarcity of paper and pulp, and the necessity of putting customers on an allotment basis. In comparison, the present war period and the outlook for the future during disturbed world conditions give every reason to believe that both mills and merchants have learned many lessons from the period of 1917 to 1929, so that there is little likelihood of conditions getting out of hand.

In 1936, due to increased business and a rapidly changing policy of handling large contract requirements and specialty business, the Aldine Paper Company moved to its present quarters, at 373 Fourth Avenue. These spacious quarters, decorated by William Saulter one of the leading decorators in the east, are among the best appointed offices in the country. Doors on both sides of the reception room lead to a series of conference rooms reserved for the use of customers, where meetings may be held without the interruption of telephone calls. Various members of the staff occupy offices decorated in modern style.

The Walker-Goulard-Plehn Co.

The Walker-Goulard-Plehn Company of New York City actually dates back to 1855 when Maurice O'Meara opened an office at 18 Thomas Street. Shortly thereafter he moved to 27 Center Street where the business remained for some while before going to 277 Water Street. In 1880, sixty years ago, it moved to the present location at 448 to 452 Pearl Street.

Maurice O'Meara remained sole owner of the business until in 1900 it was incorporated with the founder as President and his three sons, Maurice, Jr., William and David as Vice President, Treasurer and Secretary, respectively.

When Maurice O'Meara, Sr., died in 1910 the Presidency passed to Maurice O'Meara, Jr., whose brother William then became Vice President and Treasurer and the other brother, David, continued as Secretary. At that point Elwin Walker, who had been with the house since 1907, became Assistant Treasurer.

Thomas Goulard became affiliated with the company in 1905 and Robert Plehn joined it in 1906. In 1927 the Maurice O'Meara Company was dissolved to be succeeded by Walker, Goulard, Plehn Company. Today David O'Meara is Chairman of the Board; Thomas Goulard, President; Elwin Walker, Treasurer; Robert Plehn, Vice President; Gustav Schneider, Secretary.

Taylor-Styles Co., Riegelsville, N. J.

Taylor-Styles & Co. of Riegelsville, N. J., in 1863 commenced making knives for the paper and woodworking industries and from this line of production developed a rag cutter.

There is some uncertainty as to exactly when the first Taylor-Styles all metal cutters began to displace the wooden framed hay and ensilage cutters for cutting rags but it is known that by 1875 their Giant cutter was already well known in the American paper industry.

Throughout the intervening years the line has grown until today it takes in a wide range at one extreme of which are moderate capacity cutters used by fine mills to cut cotton and linen rags into fairly exact squares and at the other extreme are five to eight tons an hour units used by manufacturers of roofing and felt papers.

Various types of cutters built by Taylor-Styles are used in the reclamation of rubber; manufacture of glue; plastics cutting; cutting pulp and fibers to exact lengths and for making paper excelsior; destroying correspondence, coupons, tickets and so forth. The line also includes a portable pulp shredder.

The present secretary of Taylor-Styles and Company, H. W. Griffin, has been active in the affairs of the company for some forty-four years.

Lobdell Car Wheel Co., Wilmington, Del.

The Lobdell Car Wheel Company of Wilmington, Delaware, was established prior to 1830 when Jonathan Bonney started an iron foundry in which to make car wheels for the newly formed Baltimore & Ohio Railroad. About 1830 he formed a partnership with Charles Bush under the style of Bonney & Bush. The partners built a new foundry and machine shop at Second and Lombard streets. In 1832 George G. Lobdell, Sr., a 14-year-old nephew of Jonathan Bonney, commenced an apprenticeship and early displayed a natural aptitude for foundry work.

In 1836 when the foreman of the shop fell ill while Bonney was away from Wilmington, eighteen-year-old George Lobdell was put in charge and continued as the active head of foundry and machine shop.

When Jonathan Bonney died in 1838 his nephew assumed his former interest in the partnership and operated the business under the firm name of Bush and Lobdell which was maintained until 1871 when the present corporate title, "Lobdell Car Wheel Co.," was adopted. After the death of William W. Lobdell in 1914, George G. Lobdell, Jr., succeeded to the presidency of the organization and now, twenty-six years later, still occupies that post.

Frederick Iron & Steel Co., Frederick, Md.

The Frederick Iron & Steel Company of Frederick, Maryland, after twenty years of specializing in paper mill pumps, have built up a wide range of pumps for every paper mill service where the centrifugal type is applicable; including general mill supply, boiler feeding, condenser circulating, hot water circulating, white water, all consistencies of stock, bi-sulphate and caustic liquor, black liquor, lime water, blow pit and other applications.

There is a heavy duty stock pump equipped with wide non-clog impeller and provided with renewable adjustable wearing plates in both sides of the impeller. These liner plates may be adjusted externally.

Frederick has also developed a vertical pump, suitable for pumping to the head box, provided with steep head-volume curve affording steady flow to the machine.

Pumps have been developed by the Frederick organization in all iron construction, bronze fitted, all bronze, stainless steel or practically any metal or alloy required for any special application.

T. B. Wood's Sons Co., Chambersburg, Pa.

T. B. Wood's Sons Company, Chambersburg, Pennsylvania, was established in 1857 at a time when the American paper industry was developing into manufacture requiring specialized machinery.

For eighty-three years the Wood's Company has specialized in power transmission machinery; its designers and engineers constantly improving and developing for the paper manufacturers a heavier line than usually sold for transmission machinery.

In 1940 their line includes bearings, clutches, couplings, contractors, hangers, pillow blocks, pulleys, v-belt sheaves and complete drives.

Recent additions in new machinery and plant facilities provide enlarged production and speedier deliveries.

Riegel Paper Corp., Milford, N. J.

In 1862, at an expenditure of $27,000, John L. Riegel and Amos Davis built a paper mill at Finesville, N. J. With a daily capacity of one ton of newsprint. A few years later the mill was changed over to the manufacture of strawboard and moved to Riegelsville, N. J., where the Riegel grist mill and sawmill were located. The grist mill, built in 1823, has been continuously operated by the Riegel family until just recently.

Community House at Riegel Ridge

Advent of Machine

John L. Riegel came into the industry just as it was entering a new era. Prior to 1804, when the Fourdrinier machine was invented, all paper had been made by hand. During the first half of the 19th Century the increasing output, largely due to the development of the paper machine, made it evident that new fibres must be found as the supply of rags, the only fibre then in general use, was rapidly becoming inadequate. Not until the 50's were processes discovered for utilizing straw, wood and jute. As a consequence of this development, the industry offered a splendid opportunity to John L. Riegel and he was one of the first to experiment with the new fibres.

Drop Warren from Firm Name

In 1867 his son Benjamin was admitted to partnership and the firm become John L. Riegel & Son. In 1873, with three additional partners, they incorporated the Warren Manufacturing Company in order to build another mill but this name was changed in recent years to Riegel Paper Corporation in the interest of simplicity and better identification. The new mill was completed at Warren Glen in 1873 and contained the second Fourdrinier paper machine. The mill was laid out for straight line production and immediately prospered. An additional machine was added and in 1889 a third mill was built at nearby Hughesville.

Fourth Mill in 1907

A fourth mill was started at Milford in 1907, and these four mills, vastly enlarged and changed, now comprise the manufacturing end of the company. Today their eleven machines turn out over 230 different kinds of paper for packaging, printing and special industrial uses. The straight line production of the Milford Mill has been augmented by the addition of a converting department, primarily for the waxing, printing and embossing of glassine and sulphite paper, and at a separate plant nearby many special lacquer-coated papers are produced.

Still under the able management of the Riegel family, the company has continued its leadership and is the largest manufacturer of glassine and greaseproof in the world as well as one of the largest makers of heavy duty specialty papers.

Benjamin D. Riegel, a grandson of the first John L. Riegel, is now Chairman of the Board of Directors, and the company's President is John Lawrence Riegel, who is also President of the American Paper & Pulp Association. The space of time between the first Riegel grist mill in 1823 and this present year of 1940 is too great to allow a very clear summary in a single page; but however briefly told it is a story of pioneer America, a small part of the reason for this country's greatness today and continued growth.

Milford, N. J., Mill of Riegel Paper Corporation

Rhinelander Paper Co., Rhinelander, Wis.

Back in the year 1882, a little pioneer settlement in the timberland of Northern Wisconsin became a small edition "boom" town when a short extension of rail was laid from the mainline to the isolated sawmill village. The three Brown brothers, pioneer owners of the sawmill, had prevailed upon a New York railroad capitalist, F. W. Rhinelander, to sponsor the new transportation facilities, and in his honor the busy little metropolis was named Rhinelander.

In 1903, "Andy" Brown, Dr. A. D. Daniels, Frank Robbins, Paul Browne, and several business associates, organized a paper company. Since Rhinelander had become the accepted name of the thriving young city, it was adopted for use by the newly created paper making concern. Much credit is due these foresighted business men whose faith and vision was responsible for the firm's founding and early growth. From a meager beginning, the company has progressed to a position where today it is the largest self-contained glassine and greaseproof mill in the world.

FOLKE BECKER

Production is confined to the specialized manufacture of glassine and greaseproof papers for packaging and protected meats, shortenings, candy, bakery items, coffee, tea, and other food products. At present, the manufacturing plant consists of a completely modern paper mill and sulphite wood pulp plant, each having a daily capacity of over 65 tons. This capacity is being greatly augmented as cited later herein.

Twelve million gallons of filtered water are currently used in the paper making process. One hundred forty tons of coal are used in producing a part of the 130,000 kilowatt hours of electricity generated daily. The coal consumed and the electricity produced would heat and electrify a city of 30,000 population, while the filtered water used would satisfy the needs of a city several times that size.

The plant, located in one of the country's most healthful regions, comprises a number of modern factory buildings where working conditions are excellent. An expertly staffed modern research and control laboratory, recently housed in extensive new quarters, is constantly testing all paper produced. Here, new products are being developed, and a wide variety of customers' paper problems are solved. When new developments occur within the industry, the Rhinelander Paper Company is quick to adopt them into their plan of operations.

This paper mill is fortunate in its strategic location adjacent to raw material. Pioneer "Andy" Brown carved the Rhinelander site and located the original paper company in the heart of a vast virgin forest. Throughout Wisconsin, Minnesota and Michigan, dozens of farmers annually harvest spruce trees whcih are marketed at the huge yards of the paper company. Also in Canada are extensive districts sending punlpwood by raft across Lake Superior where it is cured in the mills' yard. Some idea of the magnitude of these operations is evidenced by the fact that the Rhinelander Paper Company uses more than 36,000 cords of wood each year. This curing process goes on for a period of a full year so that a constant year's supply is kept on hand in the mill yard at all times.

Work is rapidly progressing on the construction of additional office space to take care of the expanding needs of the main office of the Company. Following closely on the enlargement of administrative quarters, is the erection of extensive additional plant facilities required by the modernization program recently authorized by the directors of the Company. This program, conceived and developed by Folke Becker, President of the Company, calls for the expenditure of $1,250,000 for buildings and equipment.

The work of modernizing will require about a year to complete, and will enable the plant to meet the ever-increasing competitive conditions in the paper industry. The expansion is in harmony with Rhinelander's policy of maintaining preeminence in the field by employing new techniques in laboratory research, and in adding the most modern manufacturing facilities for efficient production.

RHINELANDER PAPER COMPANY'S MILL

The major step in the new set-up is, of course, the installation of a new machine for the manufacture of greaseproof and waving specialty papers. The machine being constructed by the Beloit Iron Works will have a Fourdrinier wire

182" in width, said to be the largest machine of its kind ever built to produce glassine and greaseproof paper.

Included in the plant expansion is a new beater room, machine room, and finishing room, together with new steam boilers to operate the additional equipment. Three new digesters are being installed to produce pulp for the large machine, and these are housed in an addition to the present digester room. The filtration plant is being enlarged to give greater output for the increased production reported to be approximately ten thousand tons annually.

Rhinelander Paper Company is generally recognized as high up among the leaders in its field, and its leadership is attributed to foresight in making provisions for progressive changes within the industry and to continuous research for, and production of, high quality and uniformity in its products.

Rhinelander products enjoy a ready acceptance at home and abroad due in part to the company's continuous advertising and sales promotional activities featuring its unique quality and service.

To the paper trade of the world, the Rhinelander brand has come to signify "consistently good"—consistently good American greaseproof and glassine paper products.

The present officers of the company are: President and Treasurer, Folke Becker; Vice-President, E. A. Forbes; Secretary, Paul Browne.

Lee Paper Co., Vicksburg, Mich.

The Lee Paper Company was incorporated on July 16, 1903, at Vicksburg, Mich. and the first sheet of paper was made on May 31, 1905. The organizers elected July 20, 1903 were: Fred E. Lee, president; George E. Bardeen, vice-president; A. B. Gardner, vice-president; Norman Bardeen, secretary; Elbert S. Roos, treasurer; Charles H. Seitz, general manager, and William G. Howard, director and attorney. William H. Goodenough was General Superintendent. In the early years, the Company experienced considerable difficulty and there were many changes in operating personnel. Charles H. Seitz was succeeded as Manager in 1905 by O. H. Briggs, and in 1911 Briggs was succeeded by Norman Bardeen, under whose management the company's affairs were straightened out and successful operation begun. He continued as general manager and succeeded Fred E. Lee as president in 1931, retaining active management of the Company until his death in 1936.

Fred E. Lee, from whom the company derived its name, was president of the Round Oak Company, of Dowagiac, Michigan, and contributed heavily both to the founding of the company and also during the troubled early period when his financial stability and level headed sympathetic business judgment were sorely needed. A. B. Gardner was associated with him in Dowagiac in the stove business and gave the same generous support that was accorded by Mr. Lee. Both were active in the operation of the business in the role of director; Lee until 1936 and Gardner until 1939.

George Bardeen had been associated with the paper industry in the Kalamazoo Valley practically from its inception and was, at the time of organization of the Lee Paper Company and until his death, president and manager of the Bardeen Paper Company, of Otsego, and was one of the co-founders of the Mac Sim Bar Paper Company. He remained as vice-president and member of the board of directors of the Lee Paper Company until his death in 1924. William G. Howard was a prominent Kalamazoo Lawyer who was attorney for the company and an active member of the board of directors until his death in 1906.

The present officers are: Maxwell D. Bardeen, who joined the company in 1926 as a chemist and became superintendent in 1932 and president and manager in 1936. The 1st vice-president is Harry C. Howard, prominent attorney of Kalamazoo and associated with the company for many years as attorney and director. He is a son of William G. Howard, one of the founders. The 2nd vice-president is R. D. Nugent, president of the Round Oak Furnace Company, of Dowagiac, and a nephew of Fred E. Lee. The secretary is Byron Bishop who joined the organization in 1906, became director in 1926, and secretary in 1931. W. J. Comstock has been with the company since 1907 and has been treasurer since 1936. He is also a member of the board of directors.

Other Directors of the Company at various times were W. H. Goodenough, W. J. Ustick, Samuel Folz, C. H. McKain, John A. Howard, John F. King, Bertrand Hopper, George D. Cobb, William H. Wightman, and Florence B. Anderson. The present board is made up of the officers and Merrill W. Taylor, vice-president of the First National Bank of Kalamazoo, and Woodbury Ransom, also of Kalamazoo.

A complete improvement program has been in progress for several years. New steam and electrical generating equipment has been installed, the paper machines have been rebuilt and the entire plant electrified. Extensive plans for further improvements are projected for the next several years.

St. Regis Paper Co.—Taggart Corp.

The St. Regis Paper Company was incorporated in New York State in 1899. For the first twenty years the company manufactured newsprint in its plants in northern New York. Later, it developed lightweight catalog sheets and printing papers for directories and publications. In May, 1925, the St. Regis Paper Company merged with the Hanna Paper Corporation with plants located on the Racquette River at Norwood, Norfolk and Raymondville to become one of the largest manufacturers of sulphite and groundwood paper in the country.

R. K. Ferguson

The printing paper mills of the St. Regis Paper Company are located at Deferiet, Norfolk and Harrisville, N. Y. Its largest and most modern mill at Deferiet turns out a large tonnage of lightweight M. F. and Rotogravure for catalogs, directories and publications. Specializing in groundwood content papers for quantity runs, the Deferiet mill with its five machines manufactures Circulation M. F., Magazine Book, Standard Book, Rotowite, Rototone and Northland Catalog.

The two-machine mill at Norfolk makes printing and writing grades. The Harrisville mill manufactures Bulking, Drawing, Mimeograph, Bristol, Tag and Specialties. Harrisville also has two machines. The total capacity of these mills is upwards of 300 tons a day . . . the combined annual capacity being over 125,000 tons of paper. St. Regis also operates its own bleached and unbleached sulphite mill at Deferiet and an unbleached sulphite mill at Norfolk.

From the standpoint of raw materials, St. Regis is in a distinctly advantageous position. The St. Regis Paper Company, Ltd., of Canada, owns outright or holds cutting rights on 213,000 acres in Quebec. St. Regis also owns 150,000 acres of timberland in the Adirondacks and 335,000 acres of timber in northern New Hampshire and Vermont.

St. Regis owns the Norwood & St. Lawrence Railroad which operates from Norwood, N. Y. and connects with the Rutland Railroad and the New York Central. It has a terminal at Waddington, N. Y., on the St. Lawrence River, transporting shipments of wood and manufactured products to plants at Norfolk, Norwood, Raymondville and Chase Mills.

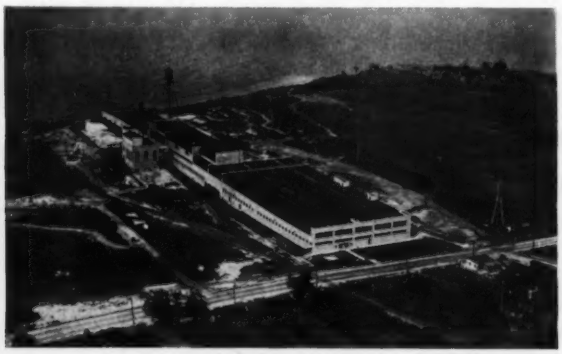
The company owns a large kraft pulp mill located in Tacoma, Wash. which was acquired in 1930. The Tacoma mill is a modern pulp mill having a capacity of more than 225 tons of bleached and unbleached sulphate pulp per day.

In February, 1929, St. Regis acquired the entire assets of the Bates Valve Bag Corporation. This company originated and developed the famous Bates Multiwall Valve Bag and filling machines for packing cement, lime, plaster and other rock products. The plants of the Bates Valve Bag Corporation are located at Nazareth, Pa., New Orleans, La., Los Angeles, Cal., Emeryville, Cal., Seattle, Wash. and The Valve Bag Company (subsidiary) at Toledo, Ohio.

At Oswego, N. Y., St. Regis operates a complete engineering and machine division for the manufacture of valve bag filling machines, bag making machinery, clutches and wire ties. This, combined with the field engineering division, enables St. Regis to render a complete packaging service.

The company sells filling machines, machine parts, wire ties, etc. throughout the world and manufac-

Deferiet Mill of St. Regis Paper Co.



Oswego Paper and Bag Plant of Taggart Corp.

tures multiwall paper bags through license arrangements in thirty-six countries.

The Panelyte Division of the St. Regis Paper Company is located in Trenton, N. J. manufacturing Panelyte, a laminated Bakelite used for refrigerator insulation and radio construction. Since 1925 this division has pioneered in the laminated plastic field. Panelyte became affiliated with St. Regis in 1929 and since that date its production has annually risen with the general increase in the plastic industry.

In 1928 the Taggart Bros. Company, later Taggart Corporation, with mills at Oswego, Watertown, Carthage and Herrings, N. Y., became affiliated with the St. Regis Paper Company. This company, founded in 1866, manufactures specification kraft, coated rope stock and kraft papers for bag manufacturing. Taggart Corporation is one of the country's large producers of kraft paper, multiwall paper bags and flour sacks.

Bird & Son, East Walpole, Mass.

Bird & Son was established in 1795 at Needham, Mass. Since that date four generations of the Bird family have conducted the business. The first of these four generations was represented by George Bird, who was born in Union, Maine, and at an early age came to Milton, Massachusetts. In 1795 he purchased waterpower and built a paper mill in Needham. That was the starting point of the business of Bird & Son.

George Bird sold his Needham mill in 1803 and leased a mill in Dedham, Massachusetts. In 1817 he purchased water power rights and land on the Neponset River in Walpole, and the business now carried on by Bird & Son has been located on this land since that time.

Francis William Bird, son of George Bird, was born in Dedham, October 22, 1809. On April 1, 1834, he purchased the business then owned by his brother, Josiah W. Bird, who had succeeded George Bird. Four years later he acquired the property known as the "Neponset Paper Company," in Walpole, from Jabez Coney, Jr.

He then formed a partnership with his father, George Bird, his brother, Josiah, and his brother-in-law, doing business under the name of George Bird & Son. After the dissolution of this firm, the business was owned and managed by F. W. Bird, under the name of F. W. Bird.

In 1871, Francis W. Bird, Jr., eldest son of Francis W. Bird, came into the business. He died in 1874. Charles Sumner Bird, second son of Francis W. Bird, entered the business in 1877. Soon afterwards he was admitted a partner and the firm name became F. W. Bird & Son.

On August 22, 1880, the paper mills were destroyed by fire. They were immediately rebuilt and enlarged.

Francis William Bird died May 22, 1894. The business was then purchased by Charles Sumner Bird, and was carried on by him without partners until January, 1913.

A plant was built in 1904 in the town of Norwood, just over the Walpole line, for the manufacture of roofing and waterproof papers. A year later a mill was built in Hamilton, Ontario, Canada, for the manufacture of roofing papers similar to those made in Norwood, Massachusetts.

The Phillipsdale, R. I. mill, where felt paper used in the roofing and floor covering products is manufactured, was built in June, 1907. In November, 1908, a paper mill for the manufacture of felt paper to be used at the Hamilton mill was purchased from the Montreal Paper Company at Pont Rouge, Canada.

In 1911 there was still a further enlargement of the business, when another plant was built in Norwood, adjacent to the roofing plant, for the manufacture of floor covering. On January 1, 1913, a partnership was formed by Charles Sumner Bird, Philip R. Allen and Charles Bird, Jr., under the name of Bird & Son. Soon after the declaration of the World War in 1914, Mr. Bird, Jr., volunteered and served in the army until the end of the war. On November 1, 1917, the plant of the West Coast Roofing Company, located in Chicago, Illinois, was purchased for the manufacture of roofing and waterproof papers.

In April, 1918, Charles S. Bird's elder son, Francis William Bird, came into the business. He died of pneumonia in August 1918. Francis William Park, in East Walpole, was dedicated to his memory upon completion in 1927.

The firm of Bird & Son was incorporated on May 10, 1918, with Charles Sumner Bird as president. He served nine years until his death on October 9, 1927. At his death Philip R. Allen was elected president, holding the office a little over seven years, until January 7, 1935. On that date Mr. Allen retired as president, but retained the office of chairman of the board of directors, Benjamin H. Roberts was elected president and Charles Sumner Bird, Jr., who had been a member of the board of directors since its incorporation, was elected vice-chairman.

The associated company, Building Products, Ltd., of Canada, has also expanded greatly in the last few years. To the plants at Hamilton and Pont Rouge were added one at Montreal and one at Portneuf, Quebec in 1926, and in 1934 a new plant was acquired at Winnipeg, Manitoba. The main office of the Canadian firm is at Montreal.

Early in 1935, Bird & Son, Inc., purchased the Berry Asphalt Company of Waterloo, Ark. The property includes an asphalt refinery and the lease of nearly forty oil wells.

New York & Pennsylvania Co., Lock Haven, Pa.

In this nation of ours, vastly rich in natural resources, straws blown by an unexpected wind have changed the lifelong careers of many men. In the case of Colonel Augustus G. Paine it was not a question of straws, but poplar chips.

Colonel Paine was born in Maine. Some time after finishing his education in Portsmouth and Portland he came to New York to become the junior partner of a drygoods commission firm, Harding, Colby & Paine. The firm was successful, but Colonel Paine did not confine his energies to its affairs. He was interested in banking, and especially in the promotion of new inventions. Many of these proved expensive, but that did not check his enthusiasm.

Col. A. G. Paine | Augustus G. Paine | Eustis Paine

By chance he became acquainted with a young man, R. H. Emerson, of Jackson, Michigan, who was working to improve the process of extracting cellulose from poplar wood for use in the manufacture of paper. This process originated in Austria but had not reached a practical stage. Several American paper companies were experimenting with this process, among them S. D. Warren & Company and The American Wood Paper Company. The last named company was the most successful and for a time, although the cost of their product was high, operated at a profit, as the growing demand for paper exceeded the raw material supply —rags and old papers.

Colonel Paine raised and furnished sufficient funds to erect a soda fiber mill at Jackson, Michigan. It was a small mill, with a capacity of 5 to 7 tons a day, and while it was an experimental plant, it operated for several years at a substantial profit. The location, however, was not suitable, and the plant was finally abandoned.

In the year 1881 a soda fiber mill was built at Willsboro, Essex County, New York. The plant was crude and not operated efficiently. The largest stockholder in the company was a friend of Colonel Paine's and induced him to loan the company a substantial sum of money, taking a mortgage on the plant as security. Result: Colonel Paine woke up one morning and found he owned the mill and was obliged to take over its management. His son, Augustus G. Paine, Jr., then 19 years of age, had returned from Europe where he was completing his education. Colonel Paine sent him to Willsboro, and also his nephew Alvah Jordan, who is now President of the Everett Pulp & Paper Company of Everett, Washington, to see what they could do to put this plant on its feet. Colonel Paine and these two young men rebuilt the plant, introducing many improvements, among which was multiple effect evaporation used in the recovery of soda from waste liquors. In short, the improvements made at this comparatively small mill revolutionized the industry, and the Champlain Fiber Company became most profitable.

This induced Colonel Paine to become interested in other paper and pulp companies. In 1899 Oliver H. Paine, Augustus G. Paine and Garrett Schenck organized the Great Northern Paper Company at Millinocket, Maine, for the manufacture of newsprint paper. Colonel Paine acquired interests in other paper

Castanea Paper Company Mill at Left and that of New York & Pennsylvania Company Is Shown at the Right

plants through the country. The Champlain Fiber Company at Willsboro, the Lock Haven Pulp & Paper Company at Lock Haven, Pennsylvania, and the Clarion Pulp & Paper Company at Johnsonburg, Pennsylvania, were controlled by three families, the Armstrong brothers of Lock Haven, the Wetherills of Chester, Pennsylvania, and the Paines of New York. With a view to economy in management, and to avoid conflicting interests, it was decided to combine these three institutions, and with that purpose in view the New York & Pennsylvania Company was incorporated in 1890. Colonel Augustus G. Paine was elected President, and retained that position until his death in 1915 when he was succeeded by his son, Augustus G. Paine, Jr.

In 1920 the New York & Pennsylvania Company, in conjunction with Crocker, Burbank & Company of Fitchburg, Massachusetts, and The Curtis Publishing Company of Philadelphia, formed the Castanea Paper Company, and erected a 150 ton paper mill at Lock Haven, Pennsylvania. These two corporations were, and are still, under the same management, and have together a daily capacity of 350 tons of soda and sulphite pulps and 600 tons of high grade book and specialty papers.

Most of the chemicals used—caustic soda, bleach and fillers—are manufactured at the plants. The companies own large tracts of woodlands which are estimated to yield a perpetual supply; also valuable coal deposits adjacent to the mills. Augustus G. Paine, Jr., after many years of service retired in 1935 as President and was succeeded by his son, George Eustis Paine, who is now serving as President of the New York & Pennsylvania Company and the Castanea Paper Company.

The Glassine Paper Co., West Conshohocken, Pa.

The Glassine Paper Company was established in 1910 at West Conshohocken, Pa. It represents 20th century youth in the industry. Comparatively little background in years but a rich background of pioneering in a new field of the industry, a field that has emerged through the short span of years an integral part of the great industry.

The manufacture of GLASSINE, a product in its infancy in this country at the beginning of the 20th Century, began in The Glassine Paper Company's Valley Forge Mills in 1910 under the ownership of The Diamond State Fibre Company and has been manufactured there continuously since that time. In 1925 The Glassine Paper Company was formed by a group of men interested in the possibilities and the development of this new paper with the result that with the help of these foresighted men this branch of the industry shows the greatest development from the years, 1925 to 1940. These same men, with a few exceptions, are still the officers of the company and recognized leaders in this branch of the paper industry. They are, Charles B. Fritz, president; Robert F. Nelson, vice-president and general manager; and George T. Fritz, secretary-treasurer.

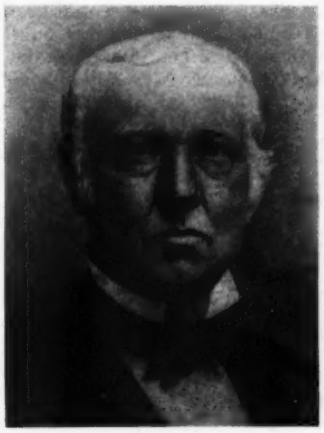
Glassine paper, once a specialty, is now widely used as a transparent wrapping of everything from foodstuffs to oiled machine parts. It is air, germ, grease and, when waxed, moisture resisting. In addition it is, in the standard grades, sufficiently transparent to display attractively the articles packaged. Retaining all of the original characteristics of the sheet, Glassine is now manufactured with super transparency that competes with Cellophane and on the other hand can be opaqued, as well as produced in practically any color desired. It is converted into every conceivable type of bag, envelope and wrap for the packaging of so many nationally known products it would be impossible to list them; also it is now the indispensable liner of cartons, bags, etc., in which are packaged products such as coffee and cereals.

The Glassine Paper Company created and perfected the now widely used laminated Glassine, trade name Paraval and Parabag and consisting of two sheets of Glassine laminated together with specially prepared waxes and wax-resins. It is a dual sheet in characteristics as well as in make-up, insofar as it not only affords protection against grease penetration but affords as high resistance to moisture-vapor penetration as any sheet of this nature on the market today. Laminated Glassine is essential for the proper packaging of foodstuffs that are easily rendered unsalable due to atmospheric changes.

Expansion of The Glassine Paper Company was imperative by 1939 and the company purchased the plant and interests of the McDowell Paper Mills in Manayunk. The McDowell Paper Mills, owned and operated by the McDowell family for 114, years manufactured many types of paper but also pioneered in the manufacture of GLASSINE and assisted materially in the development of the new paper. The Glassine Paper Company acknowledges Charles McDowell, the owner of the McDowell Paper Mills from 1888 to 1939, as a great paper maker and is justly proud to carry on the fine tradition of the McDowell family in the paper industry.

Bulkley, Dunton & Co., New York

In 1833 the business grown into the present Bulkley, Dunton & Company was initiated by Jeremiah L. Cross at 234 Pearl Street in New York City; first as a stationery store, then as a commission paper warehouse and, in 1838, as a co-partnership with Edwin Bulkley and Hiram N. Gookin under the style of Cross, Bulkley & Gookin. Eight years later the name changed to Bulkley & Gookin when Jeremiah Cross withdrew to start up in business at 240 Pearl Street in partnership with Louis Bulkley, Edwin's brother, under the style of Cross, Bulkley & Company. In 1848 Hiram Gookin withdrew from Bulkley & Gookin, Louis consolidated his interests with those of his brother and under the firm style of Bulkley & Bro. they took quarters at 110 John Street.



EDWIN BULKLEY

Buy Bancroft Mill

A marked tendency toward industrial development began to manifest itself in 1854 when the Bulkley brothers became interested in manufacturing through the purchase of the Bancroft Mill at Middlefield, Massachusetts. In 1858, their organization considerably expanded under the name of Bulkley Brother & Co., they built the Union Mill at Middlefield to meet the demands for their output of hanging paper and manila for envelopes turned out by both Middlefield plants.

Unchanged for Seventy-five Years

William C. Dunton, a natural born salesman, was among the men in the enlarged organization and the force of his personality and ability makes itself evident by the 1865 alteration of the firm name to Bulkley, Dunton & Company which has remained unchanged for seventy-five years.

Over a span of twenty-three years during which the American paper industry saw its great period of development Edwin Bulkley conducted broad-scale activity particularly throughout New England and where he promoted or otherwise became the main force in underwriting the building of one paper mill after another and providing ready and profitable outlets for their production.

New Partners Enter Firm

David G. Garabrant and Andrew Bulkley, Edwin's elder son, were taken into the firm in 1876; Moses Bulkley, the second son, joined in 1879 and in 1880 Edwin's younger son, Jonathan, was admitted. Edwin Bulkley died in 1881 after forty-three years as a conspicuous figure in the building of America's paper empire.

The history of Bulkley, Dunton & Company is remarkable for the degree of flexibility with which they anticipated impending changes or drifts and adjusted operations accordingly. At one time newsprint was a major item and when the newsprint line slanted in other directions the company put its main effort on book papers and major changes and innovations of production and marketing are evident even within this classification.

Pulp Department Organized

In 1891 the business was transferred to 75-77 Duane Street where it remained for forty-five years and in 1936 the executives offices were moved to the present building at 295 Madison Avenue and a warehouse at 32 Varrick Street acquired for paper stocks.

A pulp importing department, organized in 1912 to handle foreign wood pulp, is now under the management of Fred Enders. In 1926 agency arrangements were made for domestic pulps in the belief that before long this would be depended upon as a major source of supply. When the European war broke out thirteen years later this foresight became highly significant.

Other Departments

A paper merchandising department added in 1933 is under the direction of E. S. Sickles, selling printing papers in the New York metropolitan area. At the same time a technical department was organized whose first offering was a revolutionary patented method of paper sizing which provided improved brightness, lower acidity and lower costs while increasing sizing efficiency. This led to the organization of the American Bewoid Company. The patented Sveen method for improved wire retention of fiber and filler was later brought to the attention of the paper manufacturers. Thousands of tons of paper are now made with this process because of improved finish and quality. The technical department is also making a major contribution to the conservation of natural resources through a comprehensive study of water problems. Stream pollution is materially reduced through the application of white water clarification methods which they have developed.

The Surviving Partners

When Jonathan Bulkley passed away in 1939, his son J. O. Bulkley, and Franklyn Stone were the surviving partners. In 1940 an export company was formed headed by George G. Cobean, formerly vice-president of the Butler Paper Company of Chicago with Fred Enders, vice-president, and J. O. Bulkley, treas. Fred Enders is president of the Bulkley, Dunton Pulp Co., Inc., and J. O. Bulkley is treasurer.

DAVID G. GARABRAN

JONATHAN BULKLEY

J. O. BULKLEY

FRANKLYN STONE

Gottesman & Co., Inc., New York

Established 1886, Gottesman & Company, Inc., serves some of the foremost pulp and paper manufacturers in the world through its offices and direct agencies in important sections of North and South America and Europe, does a nation-wide business in wood pulp among American paper makers and maintains world-wide export and import trade in this essential basic commodity.

During its fifty-four years the efforts of the company have been directed solely toward the service of the one industry. Executive, sales and commercial departments occupy three floors at 22 East 40th street, New York City; European head office is at Birger Jarlsgatan 8, Stockholm, Sweden; direct agencies are maintained in Buenos Aires, Rio de Janeiro, Sao Paulo, Havana and London.

Five officers have been with the organization for an average of thirty years and this long service has enabled them to build extensive friendships throughout the world of paper and pulp as well as to acquire expert knowledge of the industry's problems. These five officers are: D. Samuel Gottesman, President; Arthur J. Sigel, Vice President; Benjamin I. Sheldon, Treasurer; B. Emanuel, Secretary.

Among the many mills for whose pulp products Gottesman & Company is selling agent are: Southern Kraft Corporation, subsidiary of International Paper Company, manufacturers of bleached and unbleached kraft pulp, with mills at Bastrop and Springhill, La., Georgetown, S. C., Panama City, Fla., Moss Point, Miss., Mobile, Ala. and Camden, Ark.; Eastern Corporation, manufacturers of bleached and unbleached sulphite and dissolving pulps for paper and rayon manufacturers, with mills at South Brewer, Lincoln and Orono, Maine; Gaylord Container Corporation, manufacturers of kraft pulp at Bogalusa, La.; Hawley Pulp and Paper Company, manufacturers of unbleached sulphite at Oregon City, Ore.; St. Lawrence Paper Mills Company, Ltd., makers of dry unbleached sulphite and dry ground wood, with mills at Three Rivers, Quebec, Canada; Lake St. John Power and Paper Company, Ltd., producers of moist unbleached sulphite and moist ground wood at Dolbeau, Quebec, Canada.

The Gottesman organization has pioneered in the importation of what have become some of the most essential grades of wood pulp. Foremost among these is kraft pulp, of which they brought in the first shiploads in the early days of the production of this quality in Scandinavia. They also pioneered in the introduction of wood pulp for the manufacture of artificial silk—shipping silk pulp from Scandinavia to the original English and American producers of the product now known as rayon.

Prior to the cessation of shipments from Europe they were the selling agent in the United States for numerous Scandinavian and Continental European wood pulp mills, including: Dynas Aktiebolag; Hylte Bruks Aktiebolag; Aktiebolaget Iggesunds Bruk; Konga Aktiebolag; Munksjo Aktiebolag; A/S Saugsbrugsforeningen; Svano Aktiebolag; Wifstavarfs Aktiebolag; Wikmanshytte Bruks Aktiebolag.

The commodities handled by the Gottesman company are bleached sulphite, easy bleaching sulphite, strong unbleached sulphite, bleached kraft, easy bleaching kraft, strong kraft, Mitscherlich pulps, quick cook pulps, wet and dry ground wood, bleached soda pulp, domestic and imported pulps of every kind and heavy chemicals for the paper industry, especially salt cake.

Hollingsworth & Vose, East Walpole, Mass.

The Hollingsworth & Vose Company was established early in the 19th century at West Groton, Mass., through the purchase and development of a paper mill by Lyman Hollingsworth, a son of Mark Hollingsworth, whose offspring were so instrumental in building up the paper industry of New England. This mill was located at West Groton, Mass., and was acquired in the early nineteenth century. This became the present West Groton plant of the Hollingsworth & Vose Company. In those days, when the manufacture of paper was a finely skilled handcraft, the rope and jute paper produced by the West Groton Mill of Lyman Hollingsworth was a standard of its time. This consisted principally of tag and pattern papers, papers for sanding and for various wrapping purposes, and was sold throughout New England, and even prior to the days of the Civil War was known and used in foreign markets. Its high reputation the logical successors of the company have held to this day, and the famous strong papers of Hollingsworth & Vose Company of the present generation need no introduction to the paper trade of the country.

In 1843 we record a great achievement in paper manufacture in the discovery of the possibilities in manila fibre made by the Hollingsworth brothers, John Mark, and Lyman. A patent was issued to them by the United States Patent Office in 1843.

In 1871 Zachary T. Hollingsworth, a nephew of the West Groton mill operator and a son of Amor Hollingsworth of Tileston & Hollingsworth, in whose mill he learned paper making, purchased the so-called Kennedy mill in East Walpole, Mass., from Francis W. Bird. This mill site was purchased in 1812 by Mr. George Bird, a paper maker, who came from Union, Maine, in 1795. He purchased the property from James Richardson, Josiah Daniel, and Eliphalet Baker, subsequently building the dam and paper mill. This was the first paper mill built in Walpole on the Neponset River, the product at that time being newspaper. In 1817 the business was continued by Mr. Bird and his son, Josiah N. Bird, under the firm name of Bird & Son. In 1871, Mr. Bird sold the property to Mr. Hollingsworth. The mill at this time contained a 48 inch machine with an output of about 2,000 lbs. a day. On September 22nd, 1873, the mill was destroyed by fire. The owner at once rebuilt it, replacing the old machine with a 62 inch cylinder machine made by Rice, Barton & Fales.

In 1875 Mr. Charles Vose entered Mr. Hollingsworth's employ as salesman. Mr. Vose had, since 1867, been employed as salesman by the wholesale paper house of B. H. Thayer & Company who were the selling agents for Mr. Lyman Hollingsworth for his West Groton and Bridgewater mill products. In 1881 Mr. Vose became an equal partner under the firm name of Hollingsworth & Vose.

The business of the company having rapidly increased, it was found necessary to increase the output and in 1881 the firm purchased from Lyman Hollingsworth his West Groton Mill, making rope manila papers. This contained one 56 inch Fourdrinier machine with a daily capacity of 6,000 lbs. During the following years the mill changed hands several times, until in the year 1846 it was burned, before which time it had been re-possessed.

In 1918 Louis E. Vose, a son of Charles Vose, who in 1898, after leaving college, had come to work in the East Walpole mill and had been since 1899 superintendent of that mill, was made manufacturing manager for both mills.

A change in the organization of the company took place when, in 1921, Z. T. Hollingsworth and Charles Vose retiring as president and vice-president respectively, and their sons, Valentine Hollingsworth and Louis E. Vose, taking their places, Robert W. Lennox was elected treasurer and purchasing agent and Thomas Compton Walsh was made sales manager, all of whom hold their respective offices at the present time. Z. T. Hollingsworth died April 1st, 1925. For several years he had practically been in retirement, although continuing to act as chairman of the board of directors. Charles Vose was active up to the time of his retirement, having, since the company's incorporation, had the managing of sales as well as the general supervision of manufacturing until the latter duties were taken over by his son in 1918, and continuing in charge of the sales until 1921. Charles Vose died January 15, 1933.

In 1929 a new 120 inch 3-cylinder machine was installed at the East Walpole mill to replace the 56 inch cylinder machine to take care of increased business. It was necessary in 1935 to add another cylinder to the machine so that a more diversified line of papers could be manufactured.

Sharp Paper & Specialty Co., Inc., New York

The Sharp Paper and Specialty Co., Inc., of New York City was established in 1923 by Bernard Sharp formerly President of the Great Eastern Paper Company. Mr. Sharp's record in the paper industry goes back to 1912 and since 1916 he has been active in the exporting of paper and paper products.

Originally located at Two Hundred Fifth Avenue the Sharp organization moved to the present offices at 220 Fifth Avenue some eight years ago.

In the seventeen years since 1923 the Sharp Paper and Specialty Company has established branches and offices in twenty-five foreign countries.

From 1923 to late in 1939 there was little of especial significance in the way of spectacular change in the exporting of American papers, whereas during the year 1940 the trend has been toward local converting in a number of important foreign markets.

Bernard Sharp

The export outlook appears favorable in late 1940 to Bernard Sharp who has built up the small organization he founded into a business which has won recognition among American mills and the business men in many parts of the world. The export outlook is favorable, that is, provided exporters are ready to adapt themselves to the customs and temperaments of the people they are serving abroad, ready to study and respect the unusual laws and regulations, methods and habits of the foreign customer.

Strathmore Paper Co.

Strathmore Paper Company, from its beginning in 1892, has expanded into one of the largest rag content paper mills in the country; its production increased 1500% from the original output of three tons daily; never deviating from the objective to "manufacture a line of printing papers that would be unique by reason of their quality and adaptability to the needs of the printing trade."

The story of Strathmore's beginning is told by Horace A. Moses, founder and president: "In 1882 I left the farm in Ticonderoga, New York, and came to Mittineague to work for the Agawam Paper Company. I was office boy, shipping and billing clerk, paymaster and bookkeeper all in one. . . . . In 1892 I took out the first shovelful of dirt that started the Mittineague Paper Company. About thirty years ago it was merged with the Woronoco Paper Company and the name changed to Strathmore Paper Company."

HORACE A. MOSES

Since 1900 Strathmore papers have been used by foreign governments for paper money; by U. S. Post Office Department for money order forms; U. S. Government printed War Saving Certificate Folders on it during World War I; U. S. Navy used it for charts; British Government uses it for Navicerts during World War II; throughout the world it is used by industrialists for stationery, by advertisers for direct mail solicitation, by publishers for permanent and high grade editions, by artists for sketching and painting; greeting cards are printed on it; American and foreign construction projects are blueprinted on it; educational institutions send graduates into all phases of life with diplomas on Strathmore papers. Manufacturing one of the world's widest range of papers, Strathmore production now includes: bonds, books, bristol boards, writings, box covers, blue prints, covers, specialties, artist papers.

The making of these papers has been achieved by the addition of new machines and the modernizing of older ones. Starting with one paper machine in 1892, Strathmore added No. 2 machine in 1896, followed by the erection of No. 2 mill and the installation of No. 3 machine in 1901. The No. 1 mill at Woronoco was acquired with its two machines in 1905, and in 1912 the No. 2 mill housing one machine was built. These paper machines are of both the fourdrinier and cylinder type and the company has one machine imported from Switzerland for the production of unique specialty papers.

Much machinery and equipment now in use in the mills was developed by Strathmore engineering department or by their chemistry and physics laboratories. Among significant developments is a high-speed beater, the first of its kind to be used in an American paper mill. Electric eyes, original control and regulating devices, safety stops and recording instruments have been devised or adapted to raise precision to the highest possible standard with maximum operating safety. In 1939 the Woronoco mills won first award in Massachusetts; in 1940 the National Safety Council gave them a perfect record award and for the same period they received the E. B. Fritz trophy for first place among the country's paper mills.

Strathmore's expansion and modernization program is reflected in the acquisition of substantial interests in the Old Colony Envelope Company of Westfield, Massachusetts, and the Rising Paper Company of Housatonic.

Domestic and foreign markets have been expanded by the introduction of a new line of printing papers—Strathmore Style Papers.

Some of the former planning upon which the growth of Strathmore has been built can be attributed to former officers who have since passed away. Willis H. Sanburn, Justus C. Sanburn, and Benjamin A. Franklin have left their time-honored imprint on this history.

Willis H. Sanburn entered the employ of the old Mittineague Paper Company in 1893 as bookkeeper and through indefatigable energy intelligently applied to the business he loved equipped himself with a thorough knowledge of fine paper making and eventually assumed charge of all manufacturing and other mill operations. In addition he became a director of the company and served as its treasurer. In January 1925 he passed away leaving a heritage of practices and policies destined to long survive his span of life.

Justus C. Sanburn, his son, selected to organize the first Strathmore laboratory immediately following his graduation from the Massachusetts Institute of Technology in 1912, became the company's first chemist and later its technical director and in later years served on the board of directors and as clerk of the corporation. In January of 1939 he died at the early age of forty-nine.

Colonel Benjamin A. Franklin, a partner in the industrial engineering firm of Miller, Franklin Company, joined Strathmore in 1910, serving as vice-president until his resignation

J. D. RINK

C. M. BRYAN

G. E. WILLIAMSON

H. E. SHATTUCK

W. H. SANBURN

J. C. SANBURN

in 1932. During those twenty-two years he had charge of sales, advertising and cost accounting; an outstanding personality in the paper industry and at one time president of the Writing Paper Manufacturers Association.

In late 1940 Strathmore has over 600 employees under the direction of Horace A. Moses, president; John D. Zink, first vice-president in charge of sales; Cassius M. Bryan, vice-president in charge of manufacturing; George E. Williamson, treasurer; Arthur E. Shattuck, assistant treasurer and manager of supply; F. Nelson Bridgham, assistant treasurer; Cy Norton, sales promotion manager; Harry E. Riggs, advertising manager; Roy F. Arnold, in charge of product development; Thomas H. Parkhill, Lawrence W. Shattuck, Harold A. Bolles, superintendents; George R. Wholean, chief engineer; P. P. Gooding, technical director.

The Northwest Paper Co.

NORTHWEST PAPER CO. MILLS AT CLOQUET, MINN.

EARLY RAILWAYS . . . PENNSYLVANIA, 1835

WHEN the Beckett Paper Company began to make papers of the text grade in 1848 there was no railroad in Hamilton and we transported our papers by wagon and canal.

William Beckett, the founder, once stood at the station in Baltimore and talked to Daniel Webster, who was inspecting a train such as that shown above, standing on rails of wood topped with strap iron. Webster remarked that the day was not distant when all-metal rails would be used and that railroads would span the continent. They did in 1869.

The Beckett mill has seen many papers come and go, but text papers have continued to be the choice of those who wish superior printing. With their interesting surfaces and elegant deckle edges they give character to printed work not obtained on any other paper.

For a generation now we have studied the possibilities of text papers in the modern world, with the result that we have provided for the trade three grades of text paper, varying in price from the moderate to the very low. They are:

BUCKEYE TEXT . . . A rag content deckle edge stock of great distinction, in white, natural and ivory.

BECKETT TEXT . . . Still lower in cost, beautiful and easy to print. Made in white, india and five colors.

TWEED TEXT . . . With tweed-mark surface, in book paper price class, but superior in appearance. In white, ivory, and four colors.

You can improve the quality of your output by specifying these papers, obtainable in all the centers of America through Buckeye and Beckett distributors.

THE BECKETT PAPER COMPANY . . . Hamilton, Ohio

Makers of Good Paper Since 1848